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THE ORIGIN OF FALSE SENEGA ROOT.

By John M. Maisch.

When in 1876 Mr. Wm. Saunders called attention to a suspicious senega root (*Proceed. Am. Phar. Assoc.*, 1876, p. 661), which afterwards became known as *white* and *false* senega, I stated my belief, that it came from a species of Polygala, though not from Pol. Senega. It disappeared from our market shortly afterwards (Proc. 1877, p. 525); but through the aid of the late W. H. Crawford, (Ibid. 1881, p. 522), I had been enabled to trace it to the neighborhood of Springfield, Mo., where it was said to have been collected. All subsequent efforts to ascertain the locality of collection, or to procure a living plant with root attached proved of no avail; though from time to time the same root was met with in commerce. In 1881 (*Amer. Jour. Phar.*, 1881, p. 388), on receiving from Dr. J. H. Gunn, of Alabama, a specimen of Polygala Boykinii, *Nuttall*, I regarded it as the parent plant of the false senega, notwithstanding most of the latter roots were larger in dimensions than the root of the plant received.

The white senega, examined microscopically by Thos. Greenish, (*Phar. Jour.* and *Tr.*, Sept. 7, 1873; *Am. Jour. Phar.*, 1873, p. 523) was believed by him to be a true senega; but Geo. Goebel (*A. Jour. Ph.*, 1881, p. 322) pointed out some striking structural and chemical differences.

That this white keelless root is derived from Polygala Senega has been maintained by many dealers; and this belief has doubtless been strengthened by papers on commercial senega by J. U. and C. G. Lloyd, who have made a special study of the indigenous medicinal plants. In *Proc. Am. Phar. A.*, 1881, p. 453, and in *Phar. Rundschau*, New York, 1889, p. 86, they describe the different commercial varieties of (southern or western, and northern) senega, all of which

are stated to come from the typical form and several varieties of Pol. Senega. In one of these papers (1881) it is stated that "Polygala Boykinii is the only native species that, to our knowledge, approaches in size the Pol. Senega;" and in the other (1889) that "continued inquiries regarding the root of Pol. Boykinii have led to completely negative results; not a single commercial lot of senega from the southern states contained that root." Prof. Chas. Mohr of Mobile, who is well acquainted with the flora of the southern states, has shown (*Phar. Rundschau*, 1889, p. 191) that the distribution of the two species is such, that an accidental intermixture of the two roots is impossible, and that the root of P. Boykinii cannot be collected in such a quantity and at a price as to become an article of commerce. (Ibid. p. 89).

While it is possible that white or false senega may occasionally be found as an admixture of officinal senega, I cannot make such a statement from personal observation; but have not doubted the difference in the botanical origin of the two roots, as I had occasion to state quite recently (AM. JOUR. PHAR., 1889, p. 381). The papers just quoted seem to render untenable my belief in the origin of the false root from *P. Boykinii;* but I am pleased to be able now to definitely identify the species yielding it.

Quite recently Messrs. Peek & Velsor, of New York City, sent me a plant, which on examination seemed to be *Polygala alba, Nuttall;* the root to which the numerous stems are attached is fully four inches in length and, beneath the crown, one-fourth inch in diameter. On comparing it with a number of specimens in several herbaria, the roots of the latter, when present, were found to be considerably smaller, more slender and less branched. The resemblance of the specimen with senega root, notwithstanding the absence of the keel, suggested the plant possibly to be a variety of the latter species with linear leaves; but the narrow-leaved specimens of true senega were observed to differ essentially in the root, leaves and flowers. Not having the means to remove every doubt, it was deemed advisable to consult some of the best judges of the flora of the western states.

In one of the letters Messrs. Peek & Velsor wrote as follows: "The shipper informs us that it is gathered in Kansas and that a few bales every year have passed through his hands to dealers and manufacturers, and that there had never before been any question as to its being Polygala Senega until we refused it."

In regard to the specimen plant, Professor Sereno Watson writes: "The Polygala sent must be *P. alba*, the root of which varies considerably in its character." Professor Thos. C. Porter writes: "The Kansas Polygala has all the characters of *P. alba*, Nuttall. In the specimens of our herbarium, from a number of widely different stations, some have roots fully as large as that of yours. The species is somewhat variable and includes *P. Beyrichii*, T. & G."

The original description of the plant as given by Nuttall in 1818 (*Genera of the North American Plants, II*, p. 87), is as follows: *P. alba.* Perennial; flowers cristate; stem simple; leaves alternate, linear, revolute on the margin; flowers racemosely spiked; spike long pedunculate, bracts deciduous; wings of the calyx rounded, about the length of the corolla. Hab.: On the plains of the Missouri, common, and the only species of the genus in the upper part of Louisiana. Obs.: A small plant scarcely more than six inches high, considerably allied to *P. Senega*, but more than a variety, as it has been considered by Mr. Pursh; leaves smooth and narrow; flowers and calyx white, nearly sessile; bracts lanceolate.

Some additional characters, giving also some of the variations of the plant, are copied from other works, namely:

Stems several from a somewhat woody root, erect or ascending, angular, at length branched above; leaves linear, narrowed towards the base, acute, or the lower ones obtuse. Stems ½ to 1 foot high. Spikes 1 to 3 inches long.—Chapman, *Flora of the Southern United States.*

Leaves linear to oblanceolate, sessile or barely petioled, margins slightly revolute; stem leafy half way to the summit; flowers deciduous, leaving the rachis roughened after their fall.—Rothrock, *Geographical survey west of the 100th meridian; VI, Botany.*

The lower leaves are often distinctly verticillate.—Sereno Watson, *Procs. Amer. Acad. of Arts and Sciences*, XVII (1882), p. 325.

It will be observed that Pursh regarded the plant merely as a variety of *P. Senega*, and that Nuttall, in 1818, pointed out its near relation to the latter species. Twenty years later, Torrey and Gray stated (*Flora of North America*, I, 131): "We have not seen this plant, but we suspect that it is a variety of *P. Senega.*" Since the resemblance extends also to the root, the latter was most likely originally collected in good faith and sold as senega; and after the difference between the two roots had been pointed out, the opinion as

to identity was probably adhered to without showing the plant to a botanist.

I append here the diagnostical characters of *P. Beyrichii* as given by Torrey and Gray (*loc. cit.*), and which are in part included in some of the quotations above: Spike dense, acute, flowers on very short pedicels; wings orbicular-obovate, concave, rather longer than the broadly obovate lateral petals; capsule oblong; seed very villous with appressed hairs; lobes of the caruncle distant, about half as long as the seed; stems numerous, somewhat branched; leaves linear or linear-spatulate, somewhat glandular.

Regarding the distribution of this species, Nuttall states that it is common "on the plains of the Missouri" and "in the upper part of Louisiana." Nuttall had explored the country along the Missouri river in 1810, when the territory of Louisiana extended northward to the British possessions. From these northern plains the species extends southward to Texas and into Mexico. Rothrock's specimens were collected in Arizona at an altitude of over 7,000 feet; and Watson's remarks quoted above refer to plants coming from several Mexican states.

It is but natural to expect considerable variation in a plant indigenous to such a large portion of the North American continent, and that these variations should apply not only to the size and shape of the stem and leaves, but likewise to the underground portion. Many of the Mexican plants in herbaria agree very well (root excepted) with the Kansas plant in my possession which has occasioned the present investigation; still other Mexican plants have been observed as *Pol. alba*, in which the inflorescence was decidedly thicker, more conical and less acute than in the other forms from Texas and farther north.

For a sample of this false senega root from Kansas I am indebted to Messrs. Peek & Velsor; it is of the same handsome light color as the false senega of 1876, and agrees in all essential characters with the false senega root seen since then, except that some of these samples are somewhat darker in color; but I have never seen it as deep brown in shade as the much larger northern senega, which has been in commerce for about ten years or more. The following description of the sample before me applies, therefore, with the variation mentioned, to all the samples seen during the past thirteen years.

Commercial false senega consists of but little broken roots, the total length of which varies between four and six inches. The head has a

ERRATA.

Page 453, line 5 from bottom, for "microscopical" read "macroscopical."

close resemblance to that found in senega root, is about five-eighths inch, sometimes an inch, in thickness, and bears above a large number of stem remnants. Beneath the head the root is suddenly contracted to the thickness of about one-fourth inch; a few small roots may usually be picked out, scarcely one-eighth inch in thickness, while some larger roots are three-eighths, or rarely one-half, inch thick. The color is pale brownish-yellow, much lighter than commercial senega is usually seen, and lighter than all other officinal roots, the white ones excepted; since the interior of the root, both bark and meditullium, is of a nearly white color, it is obvious that in bulk the color of false senega root must have a still lighter tint, approaching to white, in proportion to the abrasion of the outer layer. Older roots, particularly near the head, have a thin layer of cork of about the same shade of brown as gentian. The main root is nearly straight, and the six or eight thinner branches are descending or curved downwards, while true senega very frequently divides into almost horizontally spreading branches. The keel is absent; slight indications of it are very rarely observed, and only in the thickest roots, near the head; but even here the transverse section of the wood has a circular outline, the same as in every other part of the root and its branches. A similar regularity, regarding the cylindrical shape of the meditullium, has not been observed by me in the much thicker roots of northern senega; and that the typical form of senega has a cylindrical wood *only* in the part immediately below the head is well known. I may also mention that I have found the meditullium of the false senega, after freeing it completely from the bark, to be entirely tasteless, while the same portion of the northern senega has a gradually developed decidedly acrid taste.

The small roots in the sample agree well with *P. Boykinii;* but this species not growing in Kansas cannot be present in the sample under consideration. A histological investigation of the material on hand is contemplated, and it is hoped may reveal differences in addition to the microscopical characters pointed out. Not having seen the southern senega, of which Prof. Lloyd has handled some bales, and which was of excellent quality, but without any observable keel (*loc. cit.*, p. 88), I cannot say whether or not it was identical with false senega; but it should be noted that thus far the latter is not known to come from a southern state; the only two localities, as yet ascertained, have been pointed out by me, viz., southwestern Missouri and Kansas.

TINCTURE OF STROPHANTHUS.

By George M. Beringer, Ph. G.

The reading of Dr. E. R. Squibb's recent article on this subject (in *Ephemeris*, page 1252), recalled to my mind a few simple experiments tried about a year or so ago. As the results may possibly be of value to others I desire to here record them. As this preparation will most likely be an addition to the Pharmacopœia at the next revision, it seems desirable that all information and formulas should be placed at the disposal of the Committee on Revision. To that end, I am constrained to briefly review the salient points of the literature bearing on this subject.

The tincture as originally proposed by Prof. Fraser in 1885 was one ounce avoirdupois of the seed in eight fluidounces of tincture. It was afterwards shown by W. Martindale that this amount of menstruum did not nearly extract the drug and he suggested to make the tincture one ounce avoirdupois to the imperial pint of twenty fluidounces. This strength 1 to 20 has since been accepted by Prof. Fraser, Wm. Elborne, H. Helbing and I believe by all other investigators and adopted by the British Pharmaceutical Conference. The following is the formula of the Unofficial Formulary:

TINCTURA STROPHANTHI (TINCTURE OF STROPHANTHUS).

Take of

Strophanthus Seeds, reduced to No. 30 powder and dried at 110°F.....1 oz.

Pack in a percolator, and moisten with pure ether (sp. gr. 720). Macerate for twenty-four hours, then allow the percolation to proceed, continuing the addition of ether, until the fluid passes through colorless, (about eight or ten fluidounces suffice). Remove the marc from the percolator, and dry it, gradually heating it to 120°F. Again reduce it to powder, repack in the percolator, and moisten with rectified spirit. Macerate for forty-eight hours, then pour on successive quantities of spirit, percolating slowly, until one pint of tincture is obtained. Dose—2 to 10 minims. (*Year Book of Pharmacy*, 1888, 475.)

Dr. Squibb now proposes to prepare the tincture by the following process:

Clean well dried strophanthus seed.....256 parts.
Broken glass.....128 parts.
Stronger ether, (Sp. gr., 725 at 15·6°C).
Menstruum of 2 parts alcohol and 1 part water or alcohol of 62 per cent.; of each a sufficient quantity.

The seed and glass are ground together, the powder spread out thinly and dried at 110° F. Then pack it tightly in a percolator and percolate with ether until free from oil. The ether is then recovered by distillation. The powder is again spread out, dried and weighed, and *this weight* plus the weight of the oil is to be taken as the weight of the seed upon which to adjust the yield of tincture. Repack the percolator and percolate it slowly until 84 parts of tincture are obtained for every five parts of dry seed. (*Ephemeris*, July, p. 1252.)

There are several new features introduced in this formula worthy of comment. Dr. Squibb makes a calculation "to convert the British relation of one avoirdupois ounce to twenty British fluidounces—or of weight to measure—to the more accurate and convenient relation of the U. S. P., of weight to weight." The result of this calculation the Doctor states in the odd proportion of 5 parts of the seed to 84 parts of the tincture. This calculation is based on the assumption that because an alcohol of sp. gr. ·8914 produces a tincture of ·8931 sp. gr. a tincture of ·840 sp. gr. would be produced by rectified spirits B. P. ·838 sp. gr. This assumption is more apt to be erroneous than correct. The truth most probably is that different samples of seed will yield various percentages of extract to alcohol, and certainly the same seed will yield a larger percentage as the proportion of water is increased. In confirmation, I would call attention to the results of H. Helbing (*Phar. Jour. and Trans.*, March 12, 1887, p. 747). "A tincture prepared with rectified spirits has the sp. gr. ·840 and a fluidounce yields about 120 mgm. of residue on evaporation. Three commercial samples had nearly the same density, but yielded respectively 88, 124 and 180 mgm. of residue. Four other tinctures were probably made with a weaker alcohol, were of a green or yellow color, varied between ·870 and ·900 in density and yielded from 170 to 242 mgm. of residue." (See AM. JOUR. PHAR., 1887, p. 425.)

It seems to me that it would be better for us to at once adopt a strength of 5 per cent., 1 part of the dried and powdered seed to 20 parts by weight of the finished tincture. The necessity for absolutely conforming to the British formula in this country does not seem to be so imperative when we compare the strengths of some of the poisonous tinctures of the U. S. and Br. Pharmacopœias.

Tr. Aconiti, U. S. P., is 40 per cent. Br. Ph. is 1 oz. to 8 fl. ozs.

Tr. Belladonnæ, U. S. P., is 15 per cent. Br. Ph. is 1 oz. to 20 fl.ozs.

Tr. Iodi, U. S. P., is 8 per cent. Br. Ph. is ½ oz. to 20 fl. ozs.

Tr. Veratri Viridis, U. S. P., is 50 per cent. Br. Ph. is 4 ozs. to 20 fl. ozs.

Tr. Opii, U. S. P., contains about 6 grs. of morphine to the fluidounce. Br. Ph. about 3·3 grains.

The second point on which we would comment is that Dr. Squibb recommends a second drying of the seeds after extraction with ether, stating that the powder then loses over five per cent. of weight additionally. He proposes to adjust the weight of the tincture to the weight of the seed after deducting this loss. As this second weighing has been omitted by all other writers, Dr. Squibb would make his tincture stronger to that extent.

Perhaps the most radical change proposed is the weakness of the alcoholic menstruum to be used (62 per cent). That rectified spirits would not entirely extract the bitter principle from the marc was proven by Mr. Wm. Elborne, who found "that the rectified spirit exhausted the seed of about 7·0 per cent. of extractive of an albuminous nature, leaving about 1·5 per cent. of the bitter principle in the marc, and that the loss of the latter would not be remedied by increasing the quantity of menstruum, due to the coagulating effect of the spirit exerted over a certain portion of the albumen with which that portion of the bitter principle was associated. By lowering the alcoholic strength of the menstruum it could readily be effected, yet not without the extraction of a corresponding large quantity of albuminous matter, which would prove highly objectionable, however, since the latter by over-dilution is on escape of the alcohol very prone to decomposition and develops a very fœtid odor.[1]—*Phar. Jour. and Trans.*, March 12, 1887.

My own experiments led me to adopt a menstruum of seven volumes of alcohol and one volume of water, yielding an alcohol of ·8530 specific gravity containing 78·52 per cent. of alcohol by weight, 84·27 per cent. by volume. A menstruum of this strength yields a tincture which after a year shows no sign of precipitation.

The sample of the seeds used in my experiments was of the Kombé

[1] According to L. Larmuth, the bitter principle on being dissolved in water will in a few days undergo some change and become far more toxic than when recently prepared. (See AMER. JOUR. PHARM., 1887, 424). These statements would indicate that Tr. Strophanthus should not be prescribed in aqueous mixtures, a fact which I believe has generally been overlooked by the medical profession.

variety. A quantity of the seeds were taken and pulverized and dried. This was now divided into two equal parts; the first packed in a percolator and thoroughly extracted with stronger ether. The ether was evaporated and yielded a residue of oil of 33·14 per cent.[1] A portion of the oil was agitated with dilute sulphuric acid. The acid liquid on separation had a decided bitter taste, and after boiling reduced Fehling's solution, showing that the ether had exerted a solvent action on the glucoside. This solvent power has been recognized by several writers on the subject and attributed to the small percentage of moisture remaining in the seeds or to the presence of alcohol or water in the ether. The difficulty of thoroughly drying the seeds at a temperature of 110° to 120°F. is shown by the second loss of weight, shown by Dr. Squibb to occur after extraction with ether. It is a fact well known to workers on plant analysis, and to which I believe Dragendorff originally called attention, that ether in the presence of oils exerts a solvent action on many substances especially of an alkaloidal nature, and to this cause I attribute the presence of glucoside in the oil extracted with ether.

The powder was now removed from the percolator, dried, and then moistened slightly with a portion of the menstruum of seven volumes alcohol and one volume water, repacked in the percolator, macerated for forty-eight hours and percolated until twenty fluidounces of tincture were obtained for every ounce of powdered dry seed used. The resulting tincture had a sp. gr. of ·8535, and a fluidounce yielded 2·7 grains of residue on evaporation. The color was a very pale green and the tincture mixed with water without sediment.

The second portion of the powdered and dried seeds was packed in a percolator and treated with petroleum ether[2] until extracted. On

[1] The percentage of oil obtained by different investigators shows a very wide range. W. Martindale, using ether as a solvent, obtained 27 per cent. Helbing reports 32·45 per cent. Dr. Squibb states 23·45 per cent.; while W. Elborne, working with petroleum ether, reports 20·8 per cent., and A. W. Gerrard obtained 31 per cent., also using petroleum ether.

[2] The petroleum spirit selected for this experiment showed a sp. gr. of 0·6829 at 60° F. corresponding to a commercial gasolin of 75° B., was entirely volatile below 140° F., and gave no greasy stain on evaporation from filter paper, nor residue on allowing 50 cc. to evaporate in a tared platinum dish. Care must be exercised in the selection of a benzin for this purpose, as much of the commercial purified gasolins and benzins are of a sulphury character, having a foul odor, and are totally unfit for pharmaceutical or chemical purposes. The writer hopes to shortly be able to publish an easy process by which the pharmacist can purify these products, the experiments now not being completed.

evaporating this benzin solution 31·54 per cent. of oil was obtained. This oil treated with dilute sulphuric acid did not yield a bitter solution and the acid liquid when boiled and tested with Fehling's solution showed no reduction. The powder was then dried and percolated as was the first portion. The resulting tincture was of a pale green color, miscible with water, had a sp. gr. of ·85372 and a fluidounce yielded on evaporation a residue of 3·13 grains.

As a result of the above experiments, I would suggest the following formula for the consideration of the Committee on Revision of the United States Pharmacopœia :

TINCTURA STROPHANTHI (TINCTURE OF STROPHANTHUS).

Take of

Strophanthus seeds, ground to a number 40 powder and dried at a temperature of 110 to 120° F.....one troy ounce.
Benzin,
Alcohol,
Water; of each a sufficient quantity to make twenty fluidounces.

Pack the ground drug tightly in a cylindrical percolator and pour on benzin until the powder is saturated and the liquid begins to drop from the percolator, close the lower orifice and leaving a layer of an inch or more of the liquid above the powder, tightly cover the percolator and allow to macerate for twenty-four hours; then slowly percolate with the benzin until a few drops of the percolate evaporated from a watch-glass leave no oily residue. Then remove from the percolator, dry and, if necessary, again reduce to powder, moisten with a small portion of a menstruum of seven volumes of alcohol and one volume of water, repack lightly in the percolator and pour on menstruum, leaving an inch or two of supernatant liquid; cover the percolator and close the lower orifice and allow it to macerate for forty-eight hours, then percolate slowly, adding gradually menstruum of the above composition until twenty fluidounces are obtained.

If it be thought desirable to maintain the present system of percentage strength for tinctures, the amount of finished product would be altered to twenty troy ounces.

Acetanilid is considered by Dr. A. H. Newth a valuable adjunct to mercurials and other topical remedies. It was usually combined with lanolin or soft paraffin in the proportion of twenty grains to one ounce.—*The Lancet.*

HYPOPHOSPHOROUS ACID AND THE OFFICINAL HYPOPHOSPHITES.[1]

By Frank X. Moerk, Ph. G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy.—No. 55.

III. HYPOPHOSPHOROUS ACID.

This acid which during the last few years has come into extensive use, while not officinal, has been introduced into the National Formulary where a new process of preparation is also given.

A number of processes of preparation have been published of which, however, only the first two mentioned appear to be used in its commercial production: The decomposition of calcium hypophosphite by either oxalic or sulphuric acid; the decomposition of barium hypophosphite by sulphuric acid; the decomposition of lead hypophosphite by hydrogen sulphide; and, finally, the process of the National Formulary in which potassium hypophosphite is decomposed by tartaric acid in presence of alcohol, which renders insoluble the acid tartrate of potassium formed in the reaction.

Two papers of interest in connection with this subject have been published: one by Mr. G. M. Beringer,[2] in which he compared specific gravities and results of neutralization of several commercial samples of hypophosphorous acid, sold as 50 per cent. acid, with an acid of this strength made by himself and which comparison proved the commercial acid to contain only from 33 to 40·5 per cent. acid; the other by Mr. Geo. Lunan,[3] in which a more extended investigation was made so as to include specific gravity, neutralization, reduction (by $HgCl_2$) and qualitative tests for calcium oxalate, free oxalic acid, calcium hypophosphite and phosphites; the reagents for the last test being acetic acid and lead acetate. No test for sulphate appears to have been made; hence, it is an open question if the one sample giving the above reaction really contained phosphite or if this was due to sulphate; the reduction and neutralization determinations agreeing these can not decide this point.

Four samples of commercial acid were procured, all sold as 50

[1] Continued from page 394.

[2] Amer. Journ. Phar., 1882, 100.

[3] Amer. Journ. Phar., 1887, p. 243; reprint from *Pharm. Journ. and Trans.*, 1887, p. 773.

per cent. No. 1 was at least six years old, the others were obtained at different times within the last eighteen months. They were submitted to the following tests:

Sulphuric acid by use of $BaCl_2$ and HCl.

Calcium oxalate by making slightly alkaline with ammonium hydrate, acidifying with acetic acid (to redissolve calcium phosphate) and filtering off the calcium oxalate; the filtrate is tested for

Calcium phosphate by rendering slightly alkaline with NH_4OH; an immediate flocculent precipitate indicating this salt. The filtrate from the $Ca_3(PO_4)_2$ is divided into two parts; one part is tested for

Other calcium salts (sulphate and hypophosphite) by addition of ammonium oxalate; the other part for free

Oxalic acid by adding calcium chloride.

Phosphorous acid was not tested for directly, but indirectly by noting the excessive acidity over the reducing value after allowing for an excess of calcium hypophosphite and any free acid (sulphuric or oxalic) which might be present.

The neutralizing power of the various samples was determined by weighing in a small glass-stoppered bottle from 2 to 5 gm. of the acid and afterwards rinsing the stopper and bottle until the acid was completely removed, adding a little phenolphthalein as indicator and titrating with normal NaOH. Mr. Lunan in the paper referred to used extraordinary precautions to prevent change of the indicator (methyl-orange) by the reducing properties of the acid; the conditions under which he titrated were extreme dilution and running the diluted acid from a burette into the dilute NaOH and indicator. A few experiments convinced me that these fears were groundless; the strong acid and a very diluted acid giving the same results on titration.

The reducing value was determined with about 0·5 gm. by either the mercuric chloride or bromine method (with the latter method the precautions on pages 332 and 387 must not be forgotten).

The results are expressed in parts in one hundred:

		I.	II.	III.	IV.
H_3PO_2	neutralization	32·76	32·76	38·22	44·76
	reduction	30·10	34·19	39·11	45·14
CaC_2O_4		———	———	0·36	0·71
$Ca_3(PO_4)_2$		———	0.11	———	———
H_2SO_4		2·69	trace	0·27	0·69
CaO from other Ca salts		0·38	0·71	0·80	0·68

It will be seen that only in No. 1 the acidity exceeds the reducing value, but this is found by the complete analysis to be due to an excess of sulphuric acid having been used in its preparation; the 0·38 CaO is the only basic constituent found, to neutralize which 0·66 H_2SO_4 is required, leaving an excess of 2·03 per cent. sulphuric acid, which in the original neutralization was expressed as 2·66 per cent. H_3PO_2, this being the excess of acidity over the reduction. As H_2SO_4 is dibasic and H_3PO_2 monobasic, one molecule of the former is equivalent to two molecules of the latter, and by the equation these 2·03 per cent. H_2SO_4 are equivalent to 2·72 per cent. H_3PO_2

$$H_2SO_4 : 2H_3PO_2$$
$$98 : 132 :: 2{\cdot}03 : x = 2{\cdot}72 \text{ per cent.}$$

These calculations prove the absence of phosphorous acid, although its presence was indicated by the relationship of the neutralization and reducing values; moreover, the sample gave a decided precipitate with the acetic acid and lead acetate test.

The other samples show a greater reducing than neutralizing value, indicating at once the presence of undecomposed calcium hypophosphite. The calculations in these cases were made as follows: After the removal and estimation of the calcium phosphate and oxalate, if present, the calcium oxide remaining in the solution was found, and from this substracted sufficient CaO to neutralize the H_2SO_4 present in the acid; the remaining CaO was then calculated as $Ca(H_2PO_2)_2$ and the figures obtained in this way agreed very well with those calculated from excessive reduction over neutralization.

The specific gravities given were taken at 15·5°C. The calculations give the following percentage composition to the purchased samples:

	I.	II.	III.	IV.
Sp. Gr.	1·14778	1·15761	1·18011	1·21373
H_3PO_2	30·11	32·76	38·22	44·76
$Ca(H_2PO_2)_2$	———	1·84	1·15	0·85
H_2SO_4	2·03	———	———	———
$CaSO_4$	0·92	trace	0·37	0·96
CaC_2O_4	———	———	0·36	0·71
$Ca_3(PO_4)_2$	———	0·11	———	———

From the results it is evident that the reason of the commercial acid running so low is that there is never sufficient material taken to

ensure a fifty per cent. acid; that the acid was not tested volumetrically before being placed upon the market, as this test would reveal the amount of free acid; and that the quality of the acid has not much improved since Mr. Beringer's publication in 1882. Considerable has been written regarding the presence of calcium oxalate in the acid made by use of oxalic acid. With the intention of ascertaining the amount present in a 50 per cent. acid, and at the same time obtaining the specific gravities of the acid containing various percentages of the true hypophosphorous acid, a sample was made from a specimen of calcium hypophosphite containing 98·48 per cent. $Ca(H_2PO_2)_2$. A few experiments were first made to find the best conditions for the precipitation of the calcium oxalate; using cold solutions of the acid and salt, the precipitate was fine and very difficult to wash, but if boiling solutions were employed the precipitate was crystalline and easy to wash.

34·5 gm. $Ca(H_2PO_2)_2$ were dissolved in 225 cc. boiling water, and to this added a solution of 25·2 gm. oxalic acid in 100 cc. boiling water; after boiling for one-half hour and allowing to cool, the mixture was filtered through a little absorbent cotton placed in the neck of a percolator, and the precipitate thoroughly washed with cold water. The filtrate was evaporated on a water bath to 44 grams, making a sixty per cent. acid; after taking the specific gravity the acid was diluted to fifty per cent., etc. The composition of the fifty per cent. acid showed that there was just sufficient material taken, and no excess of calcium salt was present, the neutralization and reduction figures both being 50 per cent., and containing in addition 0·97 per cent. $CaSO_4$ and 0·68 per cent. CaC_2O_4. This amount of calcium oxalate appears to be the extreme limit, being made in a boiling solution; but if this quantity is sufficient to be injurious to health may be decided by more competent persons. The specific gravities of the various acids are given a little later in comparison with the same strength acids made according to the National Formulary. These specific gravities, differing so decidedly from my own and those of other observers, a sample was prepared according to the directions from 41·6 grams potassium hypophosphite and 60 grams tartaric acid. The filtrate is intended to furnish a 10 per cent. acid; the full yield without loss should be 264 grams; the quantity in this case was 223·6 grams, a yield of about 85 per cent. The filtrate was evaporated to 44·72 grams, corresponding to a 50 per cent. acid; after taking the

specific gravity at 15·5° C. it was diluted to a 40, 30, 20 and 10 per cent. acid respectively, and the specific gravities taken.

	With Oxalic Acid.	With Tartaric Acid.
60 per cent. acid,	1·2813	———
50 " "	1·2308	1·3277
40 " "	1·1803	1·2517
30 " "	1·1319	1·1812
20 " "	1·0861	1·1161
10 " "	1·0427	1·0567

The National Formulary quotes the specific gravity of the 50 per cent. as 1·400 and of the 10 per cent. acid 1·060; these higher figures may be better understood after the analysis of the 10 per cent. acid is given. After neutralizing the acid the addition of calcium chloride produced a heavy white precipitate of calcium tartrate. The neutralization value was found to be 10·63 per cent. while the reducing value was only 8·35 per cent., indicating the presence of tartaric acid equivalent to 2.28 per cent. H_3PO_2.

$$2H_3PO_2 : H_2C_4H_4O_6$$
$$132 : 150 :: 2{\cdot}28 : x = 2{\cdot}60 \text{ per cent. tartaric acid.}$$

The potassium hypophosphite employed contained 98·21 per cent. KH_2PO_2 and the low results in the acid are possibly explained by the precipitation of some of the potassium hypophosphite when the aqueous and alcoholic solutions were mixed, leaving some of the tartaric acid in solution. It is the tartaric acid then to which is due the higher specific gravities of the acid prepared by this process, and the specific gravities given in the National Formulary would indicate that the sample of acid used in their determination contained even more tartaric acid than the sample made by me. The process is about as expensive as any that could be devised, and judging from the composition of this one sample, yields an inferior preparation to the one made with the use of oxalic acid.

In concluding this work the results may be summed in comparatively few words. 1. The hypophosphites and the acid are not prone to as rapid oxidation as has hitherto been believed. 2. With ordinary precautions and observation of the several suggestions offered in these papers, the preparation of medicinally pure salts and of the acid need be no more difficult than those of other substances in the U. S. P. 3. Should the acid be made officinal, one of 50 per cent. would be the most desirable strength and which can easily be

prepared without oxidation taking place; in this case the U. S. P. should adopt at least the specific gravity and neutralization determinations as tests of purity, the former, however, depending much upon the process of preparation.

IODIDE OF AMMONIUM.

A SIMPLE METHOD OF DECOLORIZING WHEN DECOMPOSED.[1]

By John C. Falk, Ph. G.

Iodide of ammonium, as is well known to all pharmacists, is a very unstable compound, the ammonium very easily dissociating from its union with the haloid element iodine.

This decomposition with the resultant coloration from a snow-white salt to a yellow or even dark-brown—depending on the amount of liberated iodine present, is an occurrence seen in nearly every pharmacy. In this condition the chemical is, of course, unfit for use; and, as the small quantities usually on hand in the stores do not justify the trouble and expense of manipulating in the customary methods, such a spoiled salt is generally thrown away or set aside, and a fresh supply obtained.

The pharmacopœial process for the recovery of decolorized iodide of ammonium is to wash it with stronger ether, filter off the latter, and rapidly drying the salt.

R. Rother recommends treating the salt with sulphurous acid and ammonia, and then drying on a water bath. Both these methods are somewhat troublesome to carry out, particularly when the amount of material is small (say, one or two ounces) while the pharmacopœial directions are very apt to result in an expensive product if extreme care is not taken in the use of the ether.

Having several small lots of decomposed iodide of ammonium come into my hands during the past year, it occurred to me that they might be redeemed in a manner that I have not yet seen in print. This consists simply of placing a lump of carbonate of ammonium into the bottle and allowing it to remain there until the salt has regained its normal whiteness; this may require from several days to as many weeks, the time being dependent upon the amount of material and the degree of decomposition it has undergone. The ammonia that is con-

[1] Read before the Missouri State Pharmaceutical Association.

stantly being disengaged from the unstable carbonate unites with the free iodine present to form iodide of ammonium, and, as the superfluous ammonia is subsequently allowed to escape, there is no resulting contamination with a foreign substance.

I usually remove the iodide to a large salt-mouth bottle, wrap a vitreous piece of ammonium carbonate in filter paper, drop it into the bottle, stopper tightly and place aside until the desired change has been effected. Then remove the ammonium carbonate, leave the bottle unstopped until the excess of ammonium has disappeared, when the salt is practically pure and ready for use.

DIVISION OF POWDERS.

By Hans M. Wilder.

Mr. Wiegand concludes his article on the above subject (p. 386) by saying that "when odd numbers, such as 13, 17 or 19 are ordered, the best plan is to weigh off the 13th, 17th or 19th of the whole weight," and then advises to divide the remainder by the parallelogram plan. Now, why does Mr. Wiegand not go on a step farther, and advise to divide the powders by weight, *all of them*, as the Germans do, instead of only that odd part? The only objection that can reasonably be made is that it would take more time than could well be spared in the rush of business, etc. This idea of "more time," however, is much exaggerated. In Germany, for instance, where a good many more prescriptions are put up by the individual pharmacist than here (except in hospitals and similar institutions), the pharmacists get through pretty quickly, notwithstanding that prescriptions calling for 24 or 48 powders are no rarity, in spite of having to weigh each powder separately. The writer has for months together had to put up from 70 to 100 prescriptions a day entirely unassisted, and often had a dozen or more prescriptions at a time waiting for him, still he managed to finish within a reasonable time; of course, without some kind of a system it would have been impossible to do so.

Now as to the division of powders: The parallelogram plan is a decided improvement on the "guess-by-eye," but weighing each powder separately is still more accurate; what little time more there may have been used is balanced by the satisfaction of *knowing* that

each one of your powders is of the proper weight. Owing to the fact that in dividing, say twelve, not too small powders by weight the last one will usually be short about 1 or 1½ grains, the writer has been in the habit of taking this shortage into account. If the bulk of the powders weighs, for instance, 180 grains, and has to be divided into twelve powders, the writer weighs off 14½ grains instead of 15 grains, and finally distributes the few grains left in the mortar by the eye. That fraction of a grain, which through unequal distribution one or the other powder may get too much or too little, is of no practical account.

PHARMACEUTICAL NOTES.

Abstracts from Theses.

Unguentum Hydrargyri.—Jacquemaire's recommendation (see AM. JOUR. PHAR., 1888, p. 344) for the rapid preparation of mercurial ointment has induced D. B. Bowman, Ph. G., to experiment with different amalgams in comparison with the process of the present pharmacopœia, by which the extinction of the mercury is facilitated by trituration with compound tincture of benzoin and a little mercurial ointment. Working by this process the globules of mercury became invisible to the naked eye in ten minutes, and the ointment was finished in thirty minutes. The amalgams were prepared in the proportion of 1000 mercury to 1 K, Na, Zn, Sn or Mg; and were triturated directly with the fats and, in separate experiments with the tincture and ointment, as stated. The amalgams with K or Na combined with the fats with difficulty and in part only, the mercury finally separating partly. The Sn amalgam combined better and after an hour's trituration showed no globules visible to the eye; while the zinc amalgam was not completely extinguished. Using Mg amalgam the ointment was finished in fifteen minutes.

On triturating the amalgams with tincture and ointment, as directed by the U. S. P., the ointment was finished, using Sn, in fifteen minutes; while the globules became invisible to the eye in ten minutes with Zn; in fifteen minutes with K; in thirty minutes with Mg, and in two hours with Na.

Pill excipient.—A useful excipient for substances which are very difficult to make into a proper pill mass is prepared by John Howard Witherow, Ph. G., by dissolving with the aid of a gentle heat 100

grains powdered gum arabic and 5 grains benzoic acid in 2 oz. glycerin and adding 4 oz. commercial glucose.

Excipient for Pills of Potassium permanganate.—A slight modification of Mr. Martindale's excipient (see AM. JOUR. PHAR., 1884, p. 436; 1886, p. 337) is suggested by Gideon H. Macon, Ph. G., substituting spermaceti for paraffin. The proportions are, soft paraffin 2 parts, spermaceti 1 part, and kaolin 3 parts.

Tinctura Gentianæ composita, U. S. P., is recommended by Oliver B. Jacobs, Ph. G., to be prepared with a menstruum of alcohol 3 parts and water 1 part, when it will remain permanently clear. Using alcohol 2 parts to water 1 part, the tincture showed a slight precipitate in two weeks. Made with strong alcohol, the tincture was less bitter in taste and contained about 3·12 per cent. of solid matter, while the tincture made with the menstruum suggested yielded 5 per cent. of extract.

Blackberry brandy, as met with in commerce, varies considerably in appearance and composition. John P. Kelly, Ph. G., procured from manufacturers four formulas for the preparation of blackberry brandy, which are as follows:

1. Fluid extract of blackberry bark, 2 parts; syrup, 2 parts; whiskey, 4 parts.

2. Blackberry juice and brandy, equal parts.

3. Blackberry root, cinnamon, cloves, glycerin and brandy; no proportions given.

4. Blackberry juice, syrup, spices, New England rum; no proportions given.

Four samples, procured respectively from the states of New York, New Jersey, Kentucky and Pennsylvania were examined, with the following results:

1.	1·022	specific gravity;	15	per cent.	(weight)	alcohol;	19	residue.
2.	1·013	"	"	29	"	"	"	17	"
3.	1·103	"	"	25	"	"	"	35	"
4.	1·033	"	"	13	"	"	"	20	"

The "residue" was obtained by evaporation on a water-bath (temperature not given) until it ceased to lose weight; it appeared to contain considerable glucose and glycerin. The four samples produced dark blue precipitates with lead acetate, due to the presence of tannin and coloring matter; they possessed more of the characters of fruit-wines than of brandy.

NOTES FROM VARIOUS JOURNALS.

COLLECTED BY GEO. M. BERINGER, PH. G.

Thiocamf.—Dr. J. E. Reynolds proposes under this name a new disinfectant prepared by acting on camphor with sulphur dioxide. At ordinary temperatures SO_2 requires a pressure of more than two atmospheres to liquefy it; but camphor owing to chemical attraction can liquefy it without any pressure whatever. In the liquid thus prepared several known bactericides are dissolved. Thiocamf can be preserved without pressure in bottles at mean temperature, mere exposure of the liquid in a thin layer to the air determines the steady evolution of sulphur dioxide. The contents of a six-ounce bottle will yield over 20,000 cc. SO_2. One ounce of Thiocamf shaken up with a quart of water forms a powerful disinfectant for ordinary purposes, while a more dilute solution (1 oz. to the gallon) can be used for soaking clothes which have been in contact with infected persons.—*Chem. News*, June 22, p. 291.

Purification of Bisulphide of Carbon.—In a paper read before the London Chemical Society, Ignatius Singer describes an improved form of furnace and retorts for the manufacture of carbon bisulphide on the large scale. The crude product obtained contains considerable quantities of sulphur, H_2S, and other sulphur compounds, has a pale yellow color and a very disagreeable odor. The author recommends the following method for its purification: A cylindrical vessel about 30 inches in diameter and 6 feet high is provided with a perforated coil of lead pipe at the bottom. The CS_2 to be purified is run into this vessel to about one-third its height. Then lime water is pumped into the vessel through the perforated coil. The lime water being specifically lighter than the CS_2 rises to the surface, and while traversing the body of the bisulphide in a finely divided spray, the lime combines with the H_2S etc. This washing is continued until the lime water which leaves the vessel through an overflow pipe near the top, is perfectly clear. The CS_2 is now run into a still, about 1 per cent. of cheap colorless oil added and covered with a layer of about 1 inch of water to which some sugar of lead may be added. The CS_2 is now distilled in a water bath and condensed in the usual way.—*Jour. Soc. Chem. Industry.*

Test to Distinguish Resorcin from Carbolic or Salicylic Acid.—If a few drops of a solution of sodic hypochlorite are added to a watery or

alcoholic solution of resorcin, a violet color, rapidly changing to yellow, is produced. On warming or adding excess of the reagent the liquid gets dark brown. One part of resorcin dissolved in 10,000 parts of water will still show the reaction. Carbolic, salicylic, benzoic and other allied acids do not show the reaction, and at the most turn only slightly yellow on warming. Pyrocatechin, when treated with the reagent, turns a vanishing green; hydroquinone soon gets yellow or red. Another test is to first add a little liquor ammoniæ and then a few drops of the hypochlorite, when the liquid will give a reddish violet color, which changes green on boiling. The coloring matter is not taken up by benzol. The reaction is not shared by salicylic acid, benzoic acid or antifebrin, but carbolic acid thus treated turns a greenish blue, which is partly decomposed by benzol. The colors are changed to red by dilute sulphuric acid.—H. Bodde, *Nederl. Zydschr. v. Pharmacie;* reprint from *The Analyst.*

Dextrin Substitute for Gum Arabic.—A. Schumann has been granted patents in Germany for a process of manufacturing dextrin free from sugar as a substitute for gum arabic. Starch is mixed to a thick cream with cold water and treated with one per cent. of mineral acid. After 24 hours the mixture is washed until free from acid. The starch is again mixed with water to a cream and heated to 160–170°C. by superheated steam until all the starch is converted. This solution is refined and evaporated to dryness.

The active principle of Strophanthus glaber.—M. Arnaud in *Compt. rend.* described recently two crystallized substances, *ouabain*, $C_{30}H_{46}O_{12}$, obtained from the wood of *Aconkathera Ouabaio*, and *strophanthin* $C_{31}H_{48}O_{12}$, from the seeds of *Strophanthus Kombé*. He has since examined the crystallized substance contained in the seeds of *Strophanthus glaber* of Gabon, which furnish the arrow-poison of the Pahonin tribe. This principle appears to be identical with ouabain, which exhibits toxic effects almost identical with strophanthin. Hardy and Galois have also described a crystallized substance from *Strophanthus glaber*, but imperfectly for want of material. These substances are glucosides, and low temperatures must be adhered to in the extraction in order to avoid decomposition. The crystals of the glucoside from the seeds of strophanthus glaber (which gave the remarkably high yield of 4·7 per cent.) are transparent, very slender, and of rectangular form; by slow crystallization they are thicker and become opaque. The melting point is about 185° C., but a pasty condition obscures

the exact point of fusion. The crystals dissolve in 150 parts of water at 8° C. The aqueous solution exhibits left-handed polarization, and a solution containing 6·5 per cent. at 50° C. gave the coefficient a_D = —33·8. Under the influence of dilute acids and heat the substance splits up into a reducing sugar and a peculiar insoluble resin. The crystals of ouabain have the formula $C_{30}H_{46}O_{12},7H_2O$, of which only 6 molecules of H_2O are given off at 100° C.—*J. Soc. Chem. Ind.*

GLEANINGS FROM THE GERMAN JOURNALS.

By Frank X. Moerk, Ph. G.

Guaiacol may be easily distinguished from *creasote* by the following test: 2·5 cc. are dissolved in 25 cc. 90 per cent. alcohol and to 4 cc. of this solution 10 cc. pure sulphuric acid slowly added; *guaiacol* produces a red solution, the color of which is still persistent after several days; *creasote* produces only a brown color.—Dr. Karpow, *Pharm. Ztschr. f. Russl.*, 1889, 423.

A novel adulterant of whole black pepper, which is not easily detected on sight, is an ore of iron (by analysis found to agree with the so-called bean-ore). It is used in small globular pieces which only after close inspection are seen to be of a somewhat lighter color than the pepper. The weight of the adulterant requires the addition of only a small bulk to make considerable gain.—Dr. H. Weller *Chemiker Ztg.*, 1889, 1030.

Apomorphine as a test for nitrous acid and nitrites, being as sensitive as metadiamidobenzol, is especially adapted to the examination of drinking waters. 0·02 gm. crystallized apomorphine hydrochlorate are dissolved in 100 cc. of the water to be examined and then a little sulphuric acid is added; traces of nitrites are sufficient to develop a distinct red coloration. Dilute nitric acid does not interfere with this test, but concentrated nitric acid produces the same coloration, due, probably, to the reduction of the nitric acid.—*Pharm. Ztg.*, 1889, 429.

Color reaction for cocaine.—In a watch-crystal with white background or in a small porcelain capsule several crystals of resorcin (about 0·01 gm.) are agitated with six to seven drops of pure concentrated sulphuric acid and to the faintly yellow fluid 0·02 gm. cocaine hydrochlorate added; after an immediate energetic reaction the fluid assumes a beautiful blue color, becoming more intense; the

addition of a drop of sodium hydrate solution changes the blue color to red. The test applied to salts of morphine, strychnine, veratrine, and atropine gave no coloration which even approached the above.—M. Goeldner, *Pharm. Ztg.*, 1889, 471.

Composition of some non-drying oils.—The isolation of the fluid acids of the fixed oils being difficult and in some cases almost impossible, K. Hazura and A. Grüssner adopted a procedure in which the fluid fatty acids were first oxidized in alkaline solution with potassium permanganate and then the products of oxidation separated and examined. The products of oxidation of those acids found to compose the examined oils are here given:

Hypogæic acid, $C_{16}H_{30}O_2$, forms *dioxypalmitic acid*, $C_{16}H_{30}O_2(OH)_2$.

Oleic acid, $C_{18}H_{34}O_2$, forms *dioxystearic acid*, $C_{18}H_{34}O_2(OH)_2$.

Linoleic acid, $C_{18}H_{32}O_2$, forms *sativic acid*, $C_{18}H_{32}O_2(OH)_4$.

Arachis Oil.—The fluid fatty acids of this oil consist of linoleic and oleic acids and probably hypogæic acid. The oil obtained from different sources was found to contain varying quantities of hypogæic acid so that this last named acid is at times difficult to isolate.

Almond Oil.—Thirty grams of the acids from this oil after oxidation were found to yield 3·8 gm. sativic acid and 18 gm. dioxystearic acid indicating that the oleic acid is accompanied by a fair quantity of linoleic acid and to which is due the high iodine absorption of almond oil. It has always been stated that almond oil furnished the purest oleic acid but the examination of other non-drying oils may reveal an oil free from the glyceride of linoleic acid.

Sesame Oil.—From thirty grams of the acids of this oil could be obtained 7 gm. sativic acid and 12 gm. dioxystearic acid; hence linoleic acid is present in larger amount than in almond oil.—*Pharm. Post*, 1889, 520 and 545.

Sunflower Oil consists chiefly of the glycerides of linoleic and oleic acids; as the latter is present only in minute quantity this oil furnishes the best material for the preparation and study of linoleic acid. —A. Hazura, (*Monatsh. der Chemie*); *Arch. der Pharm.*, 1889, 654.

Uralium, a New Hypnotic.—Dr. G. Poppé, of Bologna, recently presented the Medico- chirurgical Society of that city with a monograph on uralium, a new hpynotic, being a composition of chloral and urethan. Poppé claims that it is both safe and efficient, and strongly recommends it in cases of insomnia of hysterical origin or cardiac trouble.—*Gaz. degli Ospitali*; *Med. News*, May 25.

ABSTRACTS FROM THE FRENCH JOURNALS.

TRANSLATED FOR THE AMERICAN JOURNAL OF PHARMACY.

TANGHININ.—M. Gley (*Comptes rend. de l'Acad. des Sci.*, June 17) announces that he has separated from the nut of *Tanghinia venenifera* 25 gm. of a crystallized principle to which he has given this name. He exhausted the seeds of fat with sulphide of carbon and treated the residuum with concentrated boiling alcohol, finally distilling the liquid and proceeding in the usual way to obtain crystals. The substance fuses at 182° C. (359·6° F.), and, at higher temperatures, burns without ash; it is soluble in about 200 parts of water; after several hours' contact with water it swells to a thick mucilage. It is very soluble in alcohol and ether and deflects polarized light to the left. Under dilute acids it decomposes into a resin and "a minute quantity of a very bitter substance." Like strophanthin and ouabain, tanghinin does not contain nitrogen. "It is neither," says M. Gley, "an alkaloid nor a glucoside." It is a powerful cardiac poison and is used in Madagascar for the execution of criminals.—*Répert. de phar.*, July.

PYRODINE MUST BE USED CAUTIOUSLY.—According to M. Guttmann (*Semaine Med., May* 8), pyrodine, or acetyl-phenylhydrazine should be administered only under great precautions from the facts that it may be toxic in very small doses and that it attacks the blood globules. He advises that the quantity administered daily do not exceed 10 cgm. (taken in one or two doses), that is if the treatment is to be prolonged. He thinks however, that treatment with pyrodine should not continue for more than three days. The *Répert. de phar.* for June, states that in a communication to the French Society of Biology, Dr. Lemoine also stated that the daily dose should be 10 cgm. and should never exceed 15 cgm., adding that 25 cgm. had given rise to grave toxic symptoms.

PURGATIVE CHOCOLATE.—M. Giraud proposes a preparation made as follows: Cacao (powdered and freed from oil), 50 gm; sugar (pulv.), 100 gm.; ol. ricini, 50 gm.; vanilla (pulv.) q. s.; make into tablets. The oil should be incorporated with the cacao and the sugar and vanilla added; the ingredients must be well worked up upon a heated slab and allowed to cool in molds.—*Bull. Soc. Ph. Côte-d'Or; Répert. ph.*, June.

QUICK METHOD OF PREPARING RIVIÈRE'S POTION.—It is proposed by Eymonnet and Kauffeisen to keep on hand two syrups made

as follows: No. 1. Citric acid, 43 gm.; distilled water, 120 gm.; sugar, 180 gm.; extract of lemon, 6 gm. No. 2. Bi-carbonate of potassium, 30 gm.; bicarbonate of sodium, 8·40 gm.; distilled water, 120 gm.; sugar, 180 gm. The syrups keep well, No. 1 being too acid and No. 2 being too alkaline to give rise to fermentation. To prepare the Rivière potion of the Codex, 17 gm. of each of these syrups are added to 58 gm. of water.—*Répert de ph.; Jour. de Méd.*, June.

Picric Acid Mixture.—The following preparation proposed by Dr. Calvelli is said to have been successfully used as a paint in erysipelas, lymphangitis and dry eczema: Picric acid, 1·50 gm.; distilled water, 250 gm.; dissolve; for external use. The application is said to have the property of reducing swellings and rapidly dispersing the heat which accompanies them.—*Monit. thérap.; L'Union phar.*, May.

Administration of Butylchloral.—The *Monit. thérap.* for May gives the following formula as the one prescribed by Dr. Liebreich for neuralgia of the tri-gemini. The preparation seems to be regarded as a specific for this condition: Butylchloral, 3 to 5 gm.; rectified spirit, 10 gm.; glycerin, 20 gm.; distilled water, 120 gm.; mix; dose, 2 to 4 tablespoonfuls.

Palatable Scraped Beef.—M. Carles, of the Bordeaux Faculty, having observed that many patients soon contract a repugnance for scraped beef, found by experiment that if the pulp be first mixed with a little beef soup and afterward with a small quantity of pea or lentil soup, and heated gently in a water-bath, the unpleasant taste and odor pass wholly away. The mass should be passed through a hair sieve before heating.—*Nouv. rem.*, June 24.

Pills of Tar and Iodoform.—Négel gives the following formula for these pills which, he says, are well supported by phthisical patients: Iodoform, 3 gm.; vegetable tar, 15 gm.; extract of opium, 60 cgm.; make 120 pills. The writer states that the addition of 5 to 10 per cent. of tar to iodoform, perfectly deodorizes the latter.—*Répert. de phar.*, July.

To Prepare Antiseptic Sponges.—The mineral matters near the stems should be carefully removed and the sponges thoroughly beaten with mallets and washed in running water. They should then be placed for six hours in a bath composed of: Hydrochloric acid, 10 gm.; water, 1 litre. Now wash thoroughly in water and soak again for six hours in a solution of: Permanganate of potash,

1 gm.; water, 1 litre. Wash again and place for two hours in a mixture of: Solution of bi-sulphate of soda, 10 gm.; hydrochloric acid, 1 gm.; water, 1 litre. The sponges (now of a yellowish-white color) should be again washed and put by for use in a solution composed as follows: Phenic acid, 1 gm.; alcohol, 5 gm.; water, 1 litre. If the odor of phenic acid is objectionable, the sponges may be preserved in the following solution: Thymol, 1 gm.; alcohol, 4 gm.; water, 1 litre.—*Bull. Soc. de Phar. de Bordeaux.*

STAR-ANISE OIL.

A star-anise tree, when at its full strength and in a favorable crop year, bears about 2¼ cwt. of fruit, which yield about 4 per cent. of essential oil, though it is said that if a less primitive still were employed than that used by the Annamites of Indo-China, the percentage might be sensibly increased. The tree yields a full and a small crop every alternate year. The Annamites distinguish three varieties of oil—white, red-brown and yellow. The first is obtained from green or badly-kept fruit, the second is the usual variety, and the yellow oil is the best; but there is very little of it to be had, as the natives rarely dry the fruit in the sun, that being a slow process and said to decrease the outturn. The natives never use star-anise oil themselves.

Until the French occupation of Indo-China the distilling was done exclusively by the Chinese merchants, who bought up the seeds from the natives, and paid a tax to the Annamite Government for the use of the stills, but since the French conquest the natives do all the distilling, hiring the stills from the Chinese. In 1887 the monopoly of purchasing star-anise oil from the natives during the seasons 1887 and 1888 was let by contract for the first time for the sum of 26,050 francs—a little more than 1,000*l.* The four principal distilling centres are Ha-Lung, Lang-Son, Ky-Lua and Dong-Dong—names which have become familiar of late as the scenes of several battles fought by the Annamites against the French. In the village of Ha-Lung alone there are twelve stills, and about sixty stills altogether in the district. The contractor has the right to levy a tax of four francs on every picul of seed sold to anyone else, but, as a matter of fact, he is now practically the only wholesale dealer in the market. In 1887 about fifty tons of oil were sold to him, for which he paid an average price of about 7·20 francs per kilo., or, say, 3s. 4d. per pound for the oil.

The cost of carrying the oil from Lang-Son, the central market, to Hanoï, the shipping port, is about 4½d. per pound, and it is believed that to the Hanoï importers and the Havre merchants engaged in the article there has been a profit on this trade (taking the average price of the two seasons) of about £10,000, or fully 30 per cent. of the entire amount.

It is thought that the lease of the oil-farming rights for the season 1889 will give rise to considerable competition, and that a much higher price will be paid for it than on the previous occasion, the more so as since then large tracts of land where the star-anise tree is grown, and which formerly were altogether outside the French jurisdiction, have been occupied by the French troops. The oil and the seed from those districts came formerly into commerce by way of China, but will now pass through the French port of Hanoi. Outside the French dominions in Tonquin the star-anise tree is said to be very scarce, and the territory at present in the hands of the French will, they believe, give them a virtual monopoly of the trade. For about fifteen years the French have been trying, at great cost, to acclimatize the trees in their African colonies on the Senegal, but without result. If we may rely upon the figures given above, the production of oil of star-anise in 1887 in French Indo-China alone equalled about 112,000 pounds, against an annual production of 94,000 pounds of oil of *Pimpinella Anisum*, according to Messrs. Schimmel & Co.'s calculation.—*The Chemist and Druggist*, June 8, p. 795.

FALSIFICATION OF OLEIC ACID BY LINOLEIC ACID.[1]

By Granval and Valser.

Oleic acid is much used in the woolen manufacture, and the presence of linoleic acid causes serious inconvenience. In testing for this adulterant, comparative experiments should be made on commercial oleic acid of good quality. (1). The impure acid has a yellowish-brown tint, paler than the standard. (2). The density is higher, say 0·912—0·919 in various samples at 15°, whilst the standard never exceeds 0·905. As the impure sample is clotty at 15°, it is necessary to take the specific gravity at a higher temperature and add 0·00064 for each degree above 15°. (3). On heating the impure acid to 50°,

[1] *J. Pharm.* [5], xix, 232–236; reprinted from *Jour. Chem. Soc.*, August, 1889, p. 799.

it becomes more consistent after cooling, and this change is accentuated each time the operation is repeated up to a certain point. (4). 50 grams dissolved in 450 cc. of 85 per cent. alcohol produces on shaking a glistening precipitate, whilst pure oleic acid dissolves completely; other oils give deposits, but not of the same character. The precipitate is collected, washed with alcohol, dried, and is then found to melt at about 47°. It is easily saponified, yielding a soda soap completely soluble in water, with which it forms a jelly on cooling when only present to the amount of 1 : 100. (5). If Poutet's reagent be applied to the impure acid, the mass remains more or less liquid, whilst oleic acid becomes solid by the following day. (6). A thin film of the impure acid soon becomes resin-like, whilst the oleic remains almost unchanged. (7). If a few drops of impure acid are added to soda-lye, an intense yellow color is produced, whilst the pure acid gives a grayish tint only.

THE SALTS OF MILK AND THEIR RELATION TO THE BEHAVIOR OF CASEÏN.[1]

By F. Söldner.

Two series of determinations of the ash constituents of milk gave the following results in grams per litre of milk:—

	Cl.	P_2O_5.	K_2O.	Na_2O.	CaO.	MgO.
I...	0·820	2·437	1·885	0·465	1·720	0·205
II...	0·980	2·400	1·720	0·510	1·980	0·200

The sulphuric acid was not determined, as it does not pre-exist in the milk, but is produced from the sulphur of the albuminoids; the small amount of iron was also neglected. In grouping the ash constituents as salts, account has to be taken of the fact that a portion of the phosphoric acid found in the ash is derived from the phosphorus of the caseïn; the amount of phosphoric acid to be deducted is 0·581 gram per litre of milk, assuming the latter to contain 3 per cent. of caseïn.

Hammarsten showed that caseïn has acid properties, yielding salts with bases, and obtained a calcium-derivative which contained 0·8 to 1·2 per cent. of lime. The author finds that there are two distinct compounds with calcium; the one, containing 2·39 per cent. of lime, shows an alkaline reaction with litmus, but not with phenolphthaleïn;

[1] *Landw. Versuchs-Stat.*, xxxv, 351—436; from *Jour. Chem. Soc.*, June, 1889.

whilst the other compound does not react either with litmus or with phenolphthaleïn, and contains only 1·55 per cent. of lime. The basicity of caseïn was also determined by titration with soda, using phenolphthaleïn as indicator. Neutral or slightly alkaline solutions of calcium-caseïn, prepared by rubbing together the corresponding amounts of caseïn and calcium carbonate, become turbid only when kept for some time; but when an alkaline calcium-caseïn solution is neutralized or acidified it at once becomes turbid. Alkaline, neutral, or just perceptibly acid solutions of calcium-caseïn do not curdle when boiled; the addition of more acid causes the solutions to curdle, the temperature required becoming lower as the amount of acid present increases. The calcium-derivative which reacts alkaline with litmus is not curdled with rennet. Hence it is probable that caseïn is present in milk as neutral calcium salt (with 1·55 per cent. of lime). Assuming this to be the case, and making the correction for phosphoric acid already given, a litre of milk will contain in grams—

	NaCl.	KCl.	K_3PO_4.	K_2O.	$Ca_3P_2O_8$.	$Mg_3P_2O_8$.	CaO (in caseïn).
I...	0·877	0·603	1·653	0·405	2·315	0·447	0·465
II...	0·962	0·830	0·903	0·595	2·793	0·436	0·465

The excess of base is probably present in the milk as organic salts, Henkel having shown that citric acid is a constant constituent of milk to the extent of at least 1 gram per litre. There is reason to suppose that milk contains a still greater amount of organic acid, and this is assumed, for the present purpose, to be citric acid.

Analyses of milk serum, prepared by Zahn's method, by filtering milk through porous battery cells, showed that the whole of the potash, most, if not all, of the soda, and the greater part of the magnesia present in milk are in the form of soluble salts, so that the caseïn salt can only be a calcium-derivative. The acidity of milk to phenolphthaleïn is probably due to the presence of acid phosphates, and to the power of caseïn of uniting with a further amount of base without becoming alkaline towards phenolphthaleïn. Calculated from the results of Series II, the salts present in the milk may be grouped as follows (in grams per litre):—

Sodium chloride	0·962	Magnesium citrate	0·367
Potassium chloride	0·830	Dicalcium phosphate	0·671
Monopotassium phosphate	1·156	Tricalcium phosphate	0·806
Dipotassium phosphate	0·853	Calcium citrate	2·133
Potassium citrate	0·495	Lime (in caseïn)	0·465
Dimagnesium phosphate	0·336		

Hammarsten (*Jahresber. für Tierchem.*, 1874, 135) considers that caseïn acts as a solvent for calcium phosphate, whilst Eugling (1885) believes that the caseïn enters into combination with tri-calcium phosphate, a view which is also held by Schaffer (*Landw. Jahrb. d. Schweiz*, 1887). Eugling's theory is rejected as being based on erroneous suppositions.

Determinations of lime and phosphoric acid were made in milk, in the serum of milk filtered through porous cells, and in the insoluble portion of milk. 36 to 56 per cent. of the phosphoric acid, and 53 to 72 per cent. of the lime are undissolved, being probably in suspension. The undissolved lime (not in caseïn) is in combination with phosphoric acid as a mixture of di- and tri-calcium phosphates (compare Duclaux, *Ann. inst. nat. agronom.*, viii). It was found that of the undissolved phosphoric acid and lime, 44 to 72 per cent. and 26 to 67 per cent. respectively, could be dissolved in carbonic or acetic acid.

Eugling (*loc. cit.*) states that the calcium salts in milk are not precipitated by ammonium oxalate. The author finds that 85 per cent. of the calcium is precipitated; at the same time there is a change in the appearance of the milk which indicates that the reactions which take place extend to the caseïn, probably with formation of an ammonium salt. Serum obtained by sodium chloride, and that obtained by alcohol, are both precipitated by ammonium oxalate, just like the serum produced by rennet. Eugling's negative result with alcohol serum was, no doubt, due to the presence of alcohol, which is shown to prevent the formation of calcium oxalate.

With regard to the decrease in the acidity of milk, observed by Schaffer (*loc. cit.*) to be produced by the action of rennet, it is found that if the caseïn is made to separate in a finely divided state, so that the whole of it may come into contact with the alkali, and if, at the same time, unnecessary dilution of the curdled milk is avoided, the acidity of the milk remains constant. Boiling has no effect on the acidity of the milk.

The belief that caseïn in milk is in combination with calcium phosphate originated in Hammarsten's observation that the curdling of milk by rennet is connected with the presence of calcium salts. Hammarsten showed that other alkaline earths may be substituted for lime, and that they may be present as sulphates and carbonates, and still have the same action (compare Lundberg, *Jahresb. Tierchem.*, 1876, 11). It is shown that calcium phosphate suspended in a caseïn solu-

tion does not help the curdling by rennet, but that the presence of a soluble calcium salt is necessary; it is immaterial whether the salt is phosphate or chloride, etc.

According to Mayer (*Milchzeitung*, x, 36), when milk is heated at 75° it undergoes a change, and at a still higher temperature, but still much below 100°, it loses its power of being curdled. Experiments made by the author show that milk does not necessarily quite lose the power of being curdled by being heated at 100°, although the time required to curdle milk so treated is much lengthened, especially with milk of less than the usual acidity. The reason that boiled milk will either not curdle at all, or requires a longer time to curdle than fresh milk, is that a part of the dissolved calcium salt is precipitated as tri-calcium phosphate. For the same reason curdling of milk by rennet is also prevented, or retarded, by adding more or less alkali. In either case, the property of being curdled by rennet may be restored to the milk by adding acid, passing carbonic anhydride through it, or by the addition of a soluble calcium salt. The author confirms Schaffer's statement that boiled milk treated with carbonic anhydride curdles more quickly than fresh milk.

ON THE ACID FERMENTATION OF MILK.[1]

By Dr. Fokker.

It has been well known for some time that the souring of milk is caused by bacteria, and one would expect that by this time the specific germ would be sufficiently well known. But it is not so. Hueppe and Marpmann, who have studied the subject minutely, are of opinion that there are more germs than one that possess the power of souring milk, and Grotenfeld has quite recently declared that the milk-souring germ is a modification of ordinary saprophytes, or that its properties are due to culture, and that there is no specific germ ferment causing the acid fermentation of milk.

Our author has spent some considerable time in experimenting on the subject, and his paper consists of a short description of these experiments, and a resumé of the conclusions he draws from them. He agrees with Grotenfeld, and thinks his own experiments justify him in maintaining that the rôle played by the germ in milk souring is a

[1] *Fortschritte der Medicin*, June 1st, 1889; translated by W. A. Stewart for the *Medical Chronicle*, July.

very subsidiary one. For his experiments he first takes four small retorts (Kölbchen) containing each 50 ccm. of sterilized milk, and adds to them different quantities of a pure culture of the so-called milk ferment germ, *e. g.*:—

Vessels.	Pure culture germs.	Acidity after One day.	Acidity after Two days.
1	1 drop	28·4	42·5
2	2 "	28·5	42·4
3	10 "	28·9	43·5
4	50 "	30·2	43·5

This experiment was repeated several times, always with a similar result. The natural conclusion is that the fermentation is influenced by something besides the germs. Might it be the casein? Before Pasteur discovered the germs Liebig held that casein was the specific milk ferment, and the following experiment supports Liebig:—

Casein prepared and filtered.	Acidity after 1 day.	Acidity after 2 days.
1	6·6	10·9
2	6·6	11·0
3	6·8	11·3
Not filtered.		
1	3·1	0·6
2	3·3	1·4
3	3·3	1·7

The next experiment with casein added is still more striking:—

	Casein added.	Acidity after 1 day.	Acidity after 2 days.
1	0	2·7	5·7
2	1 ccm.	4·0	9·3
3	5 "	7·6	12·3
4	10 "	10·7	19·7

This proves that the amount of casein has considerable influence; still, the fermentation is not in proportion to the amounts of casein added. This, however, is explained by the increased concentration of the fluid, as a parallel experiment, with fresh milk (infected with sour) and milk sugar, proves:—

	Milk sugar solution.	Acidity after 1 day.	Acidity after 2 days.
1	0	3·8	4·0
2	5 ccm.	4·5	5·4
3	10 "	5·0	7·3
4	20 "	6·5	2·1

The casein evidently plays a part—an important part, but what part? Liebig maintained that casein was itself the ferment, but Pasteur proved the germs indispensable. Pasteur's mistake lay in considering the casein only a food for the germs.

What is our author's opinion? He holds, as he explained two years ago, that animal protoplasm, as blood, muscle, etc., has the power, without the aid of germs, of turning starch into sugar and sugar into acid; casein resembles animal protoplasm in this respect, and consequently in the souring of milk two factors are at work, one acid fermentation being due to the casein and another to the germs. If this be true, the place of the casein might be taken by other substances. He finds that it is so. *Coagulated* albumen and yoke of egg have a particularly powerful action. He found also that heating the casein for one and one-quarter hours (in steam of five atmospheres pressure) had no effect in diminishing, but even increased its power as a ferment. Is the action then purely mechanical, depending like that of platinum sponge on porosity? It seems not. Wadding and amber have no effect; glass-wool, by giving alkali to the fluid, even diminishes its acidity. Sponge slightly increases it, owing to its animal basis.

One may conclude then that this "*power of furthering the production of acid*" is peculiar to animal substances. The method of action we do not know and *vital* (Wirkungen der Lebenserscheinungen) is the adjective Fokker would apply to it, *life, however, being always considered resolvable into simple chemical action.* What part do the bacteria take? Fermentation, we know, is impossible without them. The germ, as he poetically puts it, is the spark that kindles the firework—that it turns out a pillar or a temple, depends not on the spark, but on the construction of the firework; and, as a spark from another fire or a spark from a match box begins it equally well, so also, according to Grotenfeld, the fermentation may be set agoing by the regulation germ, or by an ordinary saprophyte a little bit modified.

Our author is by and bye to give us the result of further researches on the subject. He has found in the atmosphere about a goat and on the hairs of the same animal bacteria capable of souring sterilized milk. He found numerous others, but none capable of curding and acidifying to the same extent or with the same rapidity as the germ in ordinary sour milk.

ON THE ESTIMATION OF DIASTASE IN MALT EXTRACT.

By A. Percy Smith, F. C. S.

The method usually recommended for the estimation of diastase in wort or extract of malt depends for its results upon the time taken to saccharify a known weight of starch, the end of the reaction being ascertained by the failure of iodine to strike a blue color.

This method is, in my opinion, defective and inaccurate. A non-diastasic extract cannot be distinguished from one which contains a small quantity only of the ferment without the employment of an elaborate system, using starch solutions of many and varying strengths. The end reaction is not sharp, owing to the starch being reduced to a minimum and to the solution being hot.

A more convenient and exact method, although not claiming scientific accuracy, consists in estimating the reducing-power of the extract on Fehling's solution before and after digestion with an *excess* of starch during a period of four hours at a temperature of 60° C.

The starch solution I employ has a specific gravity of about 1·02, and is made by dissolving a dessertspoonful of starch in about two litres of water, using the supernatant fluid after deposition has taken place. The actual strength is of no consequence.

In the examination of thick malt extracts I make a 1 per cent. solution in distilled water, taking care not to heat it above 60°C. in the act of solution; 10 cc. of this are diluted with 150 cc. of water and boiled in a dish, while the Fehling is added from a burette held in the hand. I prefer this method to the converse, as it is easier to determine the presence than the absence of a blue tint. The operation is more rapid, and one avoids the discrepancy caused when invert sugar acts upon a larger quantity of copper solution than it is able to reduce.

In a duplicate experiment in which the copper solution is added all at once, instead of gradually, it will be found that ½ cc. less is required.

The same quantity of solution, viz. 10 cc., is digested with 25 cc. starch solution for four hours at 60° C., when it is diluted with 150 cc. water and treated as above. The number of cc. of Fehling used in each case is calculated into "sugar" per cent., and their difference into "increase per cent." Less than four hours' digestion with starch

will not suffice, although the chief part of the work is done during the first hour. Thus the following numbers show the results of a series of experiments embracing a period of four hours, and give the number of cc. of Fehling taken by 5 cc. of a 1 per cent. solution of extract of malt.

Time.....	½ hour	1 hour	1½ hour	2 hours	3 hours	4 hours
Cc. required....	10·8	11·5	12	12·5	13	13·5

A longer time than four hours has not, in my experience, been found necessary.

In dealing with wort make a 5 per cent. by *volume* solution, and proceed as above.—*The Chemist and Druggist*, June 29, p. 873.

THE PRINCIPLE OF DISINFECTION IN MEDICINE.[1]

By Dr. Carter.

Dr. Carter's object is to indicate the dawn of new methods of treatment by which the destruction of infection, hitherto only practiced outside the body, is to be transferred to the tissues—a proceeding which he fitly calls disinfection. "As an indication of the kind of work that can be done in this direction, it is only necessary to allude to some suggestive experiments by Brieger, who found that the typhoid bacillus, although it grew well in peptone, appeared to form no alkaloids from it. . . When he cultivated it in beef-tea, however, he obtained as a product of decomposition an exceedingly small quantity of ptomaine, which among other effects, caused, when injected into guinea-pigs, profuse diarrhœa. The bacilli were not killed by the peptone, they were not even prevented from growing and increasing; but they were rendered powerless for evil. Should not a single fact of this kind afford a powerful stimulus to renewed study of the relations of diet to some kinds of disease?"

"How new and how strange this is may be judged by the following quotation from Dr. Lauder Brunton's book on the 'Disorders of Digestion,' which was not published till 1886. 'One author,' he says, not even mentioning his name, 'has gone so far as to consider that the immunity which one attack of an infective disease confers against a subsequent one is due to alteration in the body, not by bacteria or other low organisms, but by a chemical substance which they produce,

[1] *Liverpool Medico-Chirurgical Journal;* reprinted from *The Medical Chronicle*, June, 1889.

and he has proposed to afford protection against the disease by cultivating the bacteria artificially, and inoculating with the poison which they produced without the bacteria themselves. This does not seem a very promising method of treatment.' Yet there was no reason for despair, for facts were now and then coming to light—the bye-products, as it were, of inquiries dedicated to other ends, and sometimes disregarded, as residual phenomena too frequently are—which at any rate showed how greatly the virulence of any bacillus could be mitigated by slight, and what, but for the experiments demonstrating their effectiveness, would have been judged perfectly useless differences in the conditions of their development. As an illustration of such mitigation may be related an incident which occurred in the course of Dr. Klein's experiments to determine the influence of perchloride of mercury on bacillus anthracis and its spores. He prepared a nutritive medium of agar-agar, meat extract, peptone, and salt, and inoculated two sets of tubes containing this mixture with the blood of a guinea-pig, dead of virulent anthrax. The mixtures in the two sets of tubes were made with similar proportions of portions of the very same materials, only that for one set was made at a different time from that of the other, and for sterilization purposes one happened to be boiled longer than the other. 'When they came to be used one set was darker than the other.' Anthrax bacilli grown on these two, and then inoculated into guinea-pigs, differed greatly in virulence. That grown on the light-colored mixture killed by the end of the second or beginning of the third day; that on the dark mixture not earlier than the end of the sixth, or even of the seventh day."

Happily, however, the theoretical objections to the method have not prevented its tentative application in practice. The greatest obstacle to its progress has been the phagocyte theory of Metschnikoff, who may or may not have drawn correct deductions from what he saw, but who, at all events, made too wide an application of his theory of the destruction of germs by the tissue cells.

"The evidence in support of the new order of ideas to which I have referred comes from various quarters. It is supplied by competent men working nearly simultaneously with different chemical agents and different methods on different animals suffering from different infective diseases, and yet it all tends to establish the same conclusion, viz., the possibility of affording protection against various kinds of infection by the employment of merely chemical agents.

Each witness, therefore, unconsciously strengthens the testimony of all the others, and thus renders it probable that the principle is a sound one, for, if one were mistaken, it is not likely that all would be.

"The first work that I will briefly mention is that of Dr. Cash, and I will relate one or two of his experiments, which fairly illustrate my meaning, in his own words:

"'A large rabbit, weighing 3,010 grams, received hypodermically in the course of seventeen days a total of ·0125 gram of corrosive sublimate' (about $\frac{1}{8}$ grain in the seventeen days, or $\frac{1}{120}$ grain per day). 'It was then inoculated with fresh anthrax blood of a guinea-pig, which had succumbed to the disease in 40 hours. . . A second unprotected animal was inoculated at the same time, and died of typical anthrax on the evening of the third day.'

"The protected animal had only a moderate rise of temperature. It lived, and was re-inoculated more than four months after the first inoculation without injury, a control animal submitted to a similar inoculation rapidly dying.

"Another protected rabbit was inoculated with the fresh blood of a guinea-pig dead of anthrax, and on the third, fourth, and fifth days after the inoculation its own blood was carefully examined, and on the two latter days unprotected guinea-pigs were inoculated with it. Both experiments were negative. No bacilli were found from the examination, and the guinea-pigs were unaffected.[1] Would not these experiments, even if they stood alone, be sufficient to stimulate inquiry and excite hope? They do not stand alone, yet the necessity of continued inquiry is shown by the next chapter in this history. It is that contributed by Dr. Klein.[2] Adopting a different method, he found the bacilli of anthrax would have their virulence so diminished by being grown in medicated culture media containing proportions of corrosive sublimate varying in amount according to the proved virulence of the bacilli, their spore-containing or sporeless character, etc., as to be capable of injection into different animals without ill effects. But he found that what would destroy the virulence of bacilli of one disease would not impair that of those of another, so that the chemical antagonizers of each must be sought by actual experiment.

"Facts of this kind cannot fail to engender hopes that we may one

[1] Thirteenth Annual Report of the Local Government Board.

[2] *Ibid.*, p. 156, *et seq.*

day be able to antagonize the cause of a fever by chemical means, *i. e.*, actually cure the disease."

The author then goes on to mention M. Gamaleia's communication to the Académie des Sciences of Paris, August 20, 1888. He made a communication to the following effect. Ordinary cultures of Asiatic cholera are innocuous when injected into pigeons. If, however, the inoculation is made into a guinea-pig, the microbe acquires there an intense virulence for pigeons, and kills pigeons, producing a dry cholera, with exfoliation of the intestinal epithelium. After the microbe thus rendered virulent has been passed a few times through pigeons, its virulence becomes such that one or two drops kills every pigeon into which it is injected in from eight to twelve hours. "It has the same effect on guinea-pigs, but now comes a startling result. Koch failed to give cholera by inoculations with the common bacillus. Yet, by inoculating a pigeon twice with an ordinary non-virulent culture of cholera, it was rendered absolutely secure from infection by the virulent blood which had killed every unprotected bird. And this was not all; for, by first of all cultivating the virus in a nutritive medium, and then heating it to 120° C. for twenty minutes, so as absolutely to destroy every contained microbe, a very active chemical substance is left in the sterilized culture, which in large doses will kill in from twenty to twenty-four hours; but in small successive doses will be entirely inoffensive and innocuous, and yet give absolute immunity against the induction of cholera by even large doses of the virulent blood."

In the December number of the *Annales de l'Institut Pasteur*, for 1887, a similar immunity is claimed to have been obtained by purely chemical vaccination against septicæmia by MM. Roux and Chamberland, while almost at the same time Dr. Salmon, in the "Annual Report of the Department of Agriculture of the United States of America," claims to have given pigeons immunity against hog cholera by injections of sterilized cultures of microbes of that malady.

The protection conferred by Pasteur's inoculations against rabies is now known to be a chemical action.

"Lastly," continues Dr. Carter, "for yet another malady and by yet another method has the same principle been established. The experimenter this time was Bouchard, and the details are given in the *Comptes Rendus de l'Académie des Sciences* for 4th June of the present year. The method was as follows: A series of animals were

inoculated with the bacillus of blue pus, and the urine passed by them until the time of their death collected and filtered through porcelain. To make quite sure that no microbes were present in the urine, it was sown in culture media, but with absolutely negative results. Some of the urine thus free from organisms was then injected every second day into three rabbits, which received 205 cc., 145 cc, and 140 cc. respectively. One rabbit was killed by an accident, the other two, at the end of from twelve to fifteen days, were affected with a paralysis of the posterior limbs, exactly like what is produced by inoculating under the skin the pyocyanic microbe. Later on these two rabbits, together with two control rabbits, were submitted to an intravenous inoculation of about 1 cc. of a culture of the pyocyanic bacillus. The control animals died speedily, the other two remained well. This experiment not only proves that the chemical product of the pyocyanic bacterial life is protective against the disease; it proves that it is *it* and not the bacterium which causes the symptoms; and, lastly, it proves that some if not all of the toxic product is eliminated by the kidneys, and thus affords another instance of the advantage and necessity of a much more extended and critical examination of the urine in disease than we have been accustomed to make.

"Can all these men—some of the ablest in their several walks—be deceived?"

I omit observations by Dr. Carter on some applications, apparently of a specific nature, of calomel, and on the value of chlorine in certain diseased conditions of the intestines; and, as I have extracted already so largely from this paper, I shall merely refer to the theory, rather suggested than put forward, that disinfection is in general a process of oxidation.

JAMES NIVEN.

Cocoanut as a Tænicide.—Parisi, of Athens, reports several cases in which the endocarp of the cocoanut acted as an efficient tænicide. No preparatory treatment is necessary. The patient drinks the "milk," and then eats the endocarp of the nut. This is followed by a feeling of abdominal uneasiness and pain, slight diarrhœa, and finally the expulsion of the tænia after some hours.—*Jour. Amer. Med. Assoc.*, March 9.

Tincture of Iodine a Cure for Warts.—Dr. Imossi, of Gibraltar, has been treating warts with internal doses of tincture of iodine in ten cases, all of which resulted favorably. The dose given was ten drops in half a glass of water, twice a day. A slight emaciation of the patient will be regained as soon as the treatment is discontinued.—*Med. News*, Aug. 24, 1889.

MAXIMAL DOSES OF NEW REMEDIES.

The following table, which contains also some remedies that have been used in the United States for a number of years, is reprinted from *Merck's Bulletin* for June, 1889, and is stated to have been compiled principally from B. Fischer's *Neuere Arzneimittel* (Berlin, 1889) and from Professor Aurep's and Dr. Voromikin's *Russian Medicinal Agenda*, 1889, I.

Medicament.	Maximal Adult Dose, by Mouth.			
	Single.		Daily.	
	Grams.	= about Grains.	Grams.	about Grains.
Acid, Cubebic	1	15	5	75
" Hydrobromic, diluted (10 per cent.)	*forty drops.*		*one hundred drops.*	
" Iodic	0·3	4½	1·2	18
" Per-osmic	0·015	¼	0·05	¾
" Sclerotic	0·06	1	0·25	4
" Valerianic	*ten drops.*		*forty drops.*	
Adonidin	0·006	1/10	0·03	½
Agaricin	0·015	¼	0·05	¾
Allyl Tri-bromide	*eight drops.*		.....	.....
Aloin	0·3	4½	0·6	9
Amylene Hydrate	4	60	8	120
Anemonin	0·03	½	0·1	1½
Antifebrin	1	15	3	45
Apiol, crystallized (*solid* Parsley-camphor)	1	15	4	60
Apo Codeine	0·03	½	0·08	1¼
Apo-Morphine Hydrochlorate	0 01	1/6	0·05	¾
Arbutin	1·	15	4	60
Arsenic Bromide	0·01	1/6	.....	.....
" Iodide	0·01	1/6	.....	.....
Asparagin	0·1	1½	0·3	4½
Aspidospermine Hydrochlorate	0·003	1/20	0·006	1/10
Baptisin	0·03	½	0·1	1½
Bebeerine Sulphate	3	45	10	150
Benzene (Benzol)	1	15	6	90
Berberine Hydrochlorate	0·06	1	0·25	4
Boldo-glucin	4	60	12	180
Butyl-chloral Hydrate	1	15	4	60
Cannabine Tannate	1	15	2	30
Cannabinon	0·1	1½	0·3	4½
Carbon Bi sulphide	*ten drops.*		*forty drops.*	
" Tri chloride	0·5	7½	2	30
Cerium Oxalate	0·3	4½	1	15
Chrysarobin	0·005	1/12	0·015	¼
Cocaine Hydrochlorate	0·15	2½	0·5	7½
Colocynthin	0·4	6	0·8	12
Coniine Hydrobromate	0·005	1/12	0·03	½
Convallamarin	0·06	1	0·3	4½
Cotoin	0·08	1¼	0·5	7½
Daturine	0·001	1/60	0·003	1/20
Duboisine	0·001	1/60	0·003	1/20
Erythrophleine Hydrochlorate	0·01	1/6	0·3	½

Medicament.	Maximal Adult Dose, by Mouth.			
	Single.		Daily.	
	Grams.	= about Grains.	Grams.	= about Grains.
Ethyl Bromide	*twenty drops.*			
" Iodide	*twenty drops.*			
Ethyl-oxy-Caffeine	0 65	10	2	30
Euonymin (Evonymin--the pure *Resinoid!*)	0·5	7½	1	15
Fluid Extract: Boldo	1	15	3	45
" " Cabbage-tree Bark (from *Andira inermis*)	2	30	6	90
" " Cascara Amarga (Honduras-bark)	4	60	10	150
" " " Sagrada (Chittem-bark)	4	60	10	150
" " Damiana (Turnera aphrodisiaca)	5	75	20	300
" " Golden Seal (Hydrastis)	2·5	38	10	150
" " Grindelia robusta	3	45		
" " Kava-Kava (Piper methysticum)	0·65	10	20 2	300 30
Fluid Extract: Lily of the Valley (Convallaria majalis)	0·5	7½	1·5	23
" " Piscidia (Jamaica Dogwood)	5	75	15	225
" " Witch-hazel (Hamamelis)	10	150		
Fuchsin	0·25	4	0·5	7½
Gelsemine Hydrochlorate	0·005	1/12	0·015	1/4
Guaiacol	0·1	1½	0·5	7½
Hasheesh	0·1	1½	0·3	4½
Helenin (*solid* Elecampane-camphor)	0·3	4½	1	15
Helleborein	0·03	½	0·12	2
Homatropine Hydrobromate, or, Sulphate	0·03	½	0·25	4
Hydroquinone (Hydrochinone)	0·8	12	1·5	23
Hyoscine Hydrochlorate	0·001	1/64	0 003	1/20
Hyoscyamine Sulphate	0·001	1/64	0·003	1/20
Hypnone (Aceto-phenone)	0·5	7½	1·5	23
Ichthyol	1	15	4	60
Iodine Tri-chloride	0·012	⅕	0·08	1¼
Iodol	0·2	3	1	15
Iridin	0·2	3	0·5	7½
Kairin	1	15	4	60
Menthol	1	15	5	75
Mercur-Thymol Acetate	0·01	⅛	0·12	2
Mercury Bi-chloride, peptonized	0·03	½	0·1	1½
" Cyanide	0·03	½	0·1	1½
" Form-amidated	0·03	½	0·1	1½
" Phenate (Carbolate)	0 03	½	0·1	1½
" Salicylate	0·03	½	0·1	1½
" Tannate	0·1	1½	0·3	4½
Methylal	4	60	8	120
Naphthalene	1	15	4	60
Naphthol, Beta	1	15	4	60
Nickel Bromide	0·5	7½	1·5	23
Nitro-glycerin	0·001	1/64	0·005	1/12
Par-aldehyd	4	60		
Parthenicine	0·2	3	1	15
Pelletierine Sulphate; or, Tannate	0·5	7½	5	75

Medicament.	Maximal Adult Dose, by Mouth.			
	Single.		Daily.	
	Grams.	= about Grains.	Grams.	= about Grains.
Pereirine Hydrochlorate	1·5	7½	2	30
Phen-acetin (para-Acet-phenetidin	1	15	2	30
Picrotoxin	0·006	1/10	0·02	1/3
Piperine	0·6	9	1·2	18
Podophyllo-toxin	0·02	1/3	0·06	1
Potassium Osmate	0·015	1/4	0·05	3/4
Propylamine, *so-called*, see Tri-methyl-amine				
Pyridine			*twenty-five Drops.*	
Quinoline (Chinoline) Tartrate	2	30	6	90
Resorcin	3	45	10	150
Salicin	2	30	10	150
Salol	2	30	10	150
Silver Cyanide	0·005	1/12	0·02	1/3
" Iodide	0·02	1/3	0·06	1
Solanine	0·1	1½	0·5	7½
Sparteine Sulphate	0·03	1/2	0·1	1½
Strophanthin	0·0002	1/333	0·0004	1/166
Sulphonal	4	60	8	120
Terpin Hydrate	0·3	4½	1	15
Terpinol	0·3	4½	1	15
Thalline Sulphate	0·5	7½	1·5	23
" Tartrate	0·5	7½	1·5	23
Tincture Strophanthus	1·5	23	5	75
Tri-methyl-amine (*erroneously called* "Propyl-amine")—10-per-cent. *Solution*	3	45	10	150
Urethane	5	75		
Xylene (Xylol)	2	30		

N. B.—All the above-stated *sizes* of dose are calculated for administration *by mouth* only.

REDUCTION OF TARTARIC ACID.[1]

By M. Ballo.

Neither Liebig's nor Baeyer's theory of the formation of sugar in plants gives any explanation of the part played by the iron which is present in chlorophyll. In investigating the action of this metal on vegetable acids, the author found that tartaric acid, when warmed with ferrous sulphate, is converted into an acid which he names isoarabinic acid, on account of the sticky nature of solutions of the calcium salt. Tartaric acid (1 part) and ferrous sulphate (1 part) are dissolved in water (about 2 parts) and the solution warmed on the

[1] *Ber.* xxii, 750—754; reprinted from *Jour. Chem. Soc.*, July 1889, p. 693.

water-bath; after a short time a greenish-yellow precipitate, consisting chiefly of the iron salt of an acid containing more oxygen than isoarabinic acid, is formed. The whole is then evaporated with constant stirring, until the residue solidifies on cooling, and is then extracted with strong alcohol. The alcohol is evaporated, the residue dissolved in water, the solution neutralized with milk of lime, filtered, evaporated to a syrup, and the calcium salt which separates dissolved in water and decomposed with the calculated quantity of oxalic acid. The filtered solution is concentrated, mixed with alcohol, separated from any undecomposed salt, and again concentrated and mixed with alcohol and ether. After keeping for a long time, a crystalline compound, which the author names isoarabinic acid hydrate separates, and the filtered solution, on evaporation, yields isoarabinic acid.

Isoarabinic acid, $C_6H_{10}O_5$, is a thick, almost colorless syrup, which is miscible with water in all proportions, and when burnt gives off a smell of burnt sugar. It is dextrorotatory, and its specific rotatory power is $[a]_D = +20°$, but it does not reduce Fehling's solution. The *potassium* salt, $C_6H_9O_5K$, is anhydrous, and crystallizes well. The *calcium* salt, $(C_6H_9O_5)_2Ca + 9H_2O$, dissolves in water, forming a sticky solution, from which it crystallizes moderately easily; it loses some of its water at 100—120°, the remainder only at a temperature so high (above 140°) that the salt is partially decomposed. It reduces ammoniacal silver solution, and readily decomposes both in solution and in the dry state, being converted into a basic salt, $(C_6H_9O_5)_2Ca,CaO + 8H_2O$. The latter is a colorless powder, and is insoluble in water, but it dissolves in potash, and is reprecipitated on boiling the solution; it reduces ammoniacal silver solution. When a solution of the calcium salt is mixed with a solution of lead acetate, a yellow precipitate, consisting principally of the salt, $(C_6H_9O_5)_2Pb$, is formed, and a colorless substance, consisting principally of the basic salt, $(C_6H_9O_5)_2Pb,2PbO$, separates from the filtrate after some time.

Isoarabinic acid hydrate (see above) has probably the composition $C_6H_{12}O_6$; it does not reduce Fehling's solution.

These results show that substances, isomeric with the carbohydrates, and other compounds richer in oxygen, are formed by the action of ferrous sulphate on tartaric acid. The quantity of ferrous sulphate employed may be as little as one-tenth the weight of the tartaric acid without influencing the results, but the author believes that direct sunlight may have some appreciable effect on the reaction. These facts

are evidence in favor of Liebig's theory of the formation of sugar in plants. It was frequently observed that the crude solutions of isoarabinic acid contain reducing substances which, however, disappeared on further investigation; this fact seems to indicate that it is possible to obtain sugar synthetically from tartaric acid or other vegetable acids.

EDITORIAL DEPARTMENT.

PHARMACISTS AND THE MEDICAL PROFESSION.—The delegation sent by the American Pharmaceutical Association to the American Medical Association, at the recent meeting in Newport, Rhode Island, to confer upon subjects of mutual interest to both professions, were warmly received by the Medical Association.

The following resolutions were passed on the third day of the meeting:

Whereas, the American Pharmaceutical Association has appointed a Committee of Conference, and sent a delegation to this Association;

Resolved, that this Association extends a cordial greeting to the representatives of the American Pharmaceutical Association, and invites them to a seat on the platform;

Resolved, that a Committee of Conference be appointed to meet the Committee of the American Pharmaceutical Association for the consideration of subjects of mutual interest and benefit;

Resolved, that this Committee report on the second day of the next annual meeting of this Association, the results of their conference, with such recommendations as they may deem advisable in the premises.

The Committee presented the claims of the National Formulary by personal solicitation, and secured favorable consideration for it.

The Committee representing the American Pharmaceutical Association were: Joseph P. Remington, Chairman; Charles A. Heinitsh, of Lancaster; Karl Simmon, of St. Paul; William M. Massey, of New York; William H. Cotton, of Newport.

Messrs. Heinitsh and Simmon having left for San Francisco, Messrs. Samuel A. D. Sheppard and J. W. Colcord, of Boston, were appointed substitutes.

The Committee of Physicians to confer jointly with the delegation are as follows: Dr. Frothingham, of Ann Arbor; Dr. Culbertson, of Cincinnati; Dr. Woodbury, of Philadelphia; Dr. Love, of St. Louis; and Dr. Shattuck, of Boston.

It is believed that some plan will be devised which will prove beneficial, by providing for regular conferences to be held at stated times by these two representative national organizations.

THE PENNSYLVANIA PHARMACY BOARD held an examination at Altoona, July 9, when twenty-five candidates applied for certificates as registered pharmacists, and eleven as qualified assistants. Eight of the former and six of the latter were successful.

THE HANBURY MEDAL is awarded every two years for prominent researches connected with the natural history and chemistry of drugs. The awarding

jury consists of the Presidents of the London Chemical Society, the Linnean Society, the Pharmaceutical Society and the British Pharmaceutical Conference, and of a pharmaceutical chemist nominated by the two last named presidents.

The first medal was awarded in 1881 to Prof. F. A. Flückiger of Strassburg. The subsequent awards were made in 1883 to John Eliot Howard, whose name is intimately connected with the history of the cinchonas; in 1885 to Prof. George Dragendorff of Dorpat, well known for the scientific investigation of medicinal plants, and in 1887 to Professor Wm. Dymock, Brigade Surgeon in Bombay, for his long continued prominent labors relating to the East Indian materia medica.

During the present year the honor has been bestowed upon Dr. Gustave Planchon, Professor of Materia Médica in the École supérieure de Pharmacie of Paris, who is the author of a valuable work on Materia Medica, has edited, after Guibourt's death, the Histoire Naturelle des drogues simples, and has enriched literature by numerous papers on various drugs embodying his researches.

The Seventh International Pharmaceutical Congress has at last been called to meet in the city of Milan during the early part of September, 1890. At the sixth congress, which was held in Brussels in 1885, it was decided to convene the next one in 1888; but like the preceding and several previous congresses it was deemed inopportune to let it take place precisely at the time originally fixed. The causes for this delay do not appear to have been made public, and no light has been thrown on it by the recent publication (*Journal de Pharmacie d'Anvers*, June) of the letters addressed by the executive officers of the Brussels Congress to the Lombardy Pharmaceutical Association. This body, it appears, early in 1888, had secured the support of the Italian government and of the Milan city authorities in favor of the project; but owing to lack of time for making all the requisite preparations for a meeting in the same year, decided to postpone it until 1889. But since it was found that during the international exposition now in progress in Paris several international meetings would be held there, in which pharmacists are especially interested (Am. Jour. Phar., July, p. 383), it was deemed best to further postpone the convening of the seventh pharmaceutical congress.

The Pharmaceutical Association of Lombardy has appointed a committee of organization, composed of about thirty of prominent Italian chemists and pharmacists, among others Ciamician, Daccomo, Guareschi, Mosca, Pavesi and Spica. Professor Stanislao Cannizzaro is president of this committee; the secretaries are Dr. Arturo Castoldi and Venturini Vittorio.

The following will be admitted as members of this congress: *a.* professors of universities, polytechnic schools and colleges; *b.* professors of physical and natural sciences of any school; *c.* pharmacists and chemists delegated by pharmaceutical associations or by sanitary authorities; *d.* members of sanitary councils or boards; *e.* assistants in institutions, laboratories or cabinets devoted to physical and natural sciences, medicine or pharmacy; *f.* chemists, directors and assistants of municipal laboratories, agricultural stations, and of all laboratories for the public service; *g.* proprietors and directors of chemical industries and chemists attached to such industries.

Those intending to participate are requested to inform the committee of their intention, if possible, before November 30th next. Communications on subjects for discussion or research are invited, with the view of preparing the program, which will be issued later. Adherents to the congress will forward the sum of 10 francs, and will be furnished with the badge, la marque de Congressiste.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Handbuch der praktischen Pharmacie, für Apotheker, Drogisten, Aerzte und Medicinal-Beamte. Bearbeitet von Dr. H. Beckurts, Professor in Braunschweig, und Dr. Bruno Hirsch, Apotheker in Berlin. Stuttgart: Ferd. Enke, 1889.

Handbook of practical pharmacy for apothecaries, druggists, physicians and medical officers.

This meritorious work is now before us completed. It forms two good sized octavo volumes of 733 and 721 pages. When the earlier fascicles appeared we commented upon the work in detail (see AMER. JOUR. PHAR., 1887, 378 and 543), and we have but very little to add now, except that all expectations have been fully realized. As stated before, the second part of the work promised to become a kind of universal pharmacopœia, inasmuch as it contains a compilation of the requirements of a number of modern pharmacopœias. It was but natural to expect that the authors should add comments from the rich mines of their own experience, and this has been copiously done, not only with strictly pharmacopœial drugs and preparations, but likewise with a number of the recently introduced medicaments.

The third part contains more than thirty tables, useful for reference, and the last 75 pages are occupied with the full and complete index, facilitating the use of this work, which will be of great value to all conversant with the German language.

Mittheilungen aus dem pharmaceutischen Institute und Laboratorium für angewandte Chemie der Universität Erlangen, von A. Hilger. München; 1889, I, II, 8 vo, pp. 180 and 309.

Contributions from the pharmaceutical institute and laboratory for applied chemistry of the university of Erlangen.

These pamphlets give an account of a number of researches undertaken by Prof. Hilger and some of his pupils on subjects connected with the sphere designed for the laboratory. Investigations on the composition and alteration of rocks, the absorbing power of soils, etc., are found in the first number; while the essays in the second number are on pharmaceutical, hygienic and forensic subjects, like foreign coloring matters in wine; inversion of saccharose; development of huckleberry and fermentation of its juice; solubility of alkaloids in xylol and in absolute ether; detection of cyanogen compounds, of opium, etc. Many new and little known facts are presented in these investigations.

Etude historique sur les Extraits Pharmaceutiques comprenant la description des divers procédés et appareils ayant servi à l'extraction des principes actifs des végétaux et à leur concentration, suivie d'une double table bibliographique, par Adrian, Pharmacien &c. Paris: Octave Doin. 1889, 8vo., pp. XVI, and 731.

Historical study on the pharmaceutic extracts, embracing the description of

the different processes and apparatus for the extraction of the active principles of plants, and for their concentration, followed by a double bibliographical table.

The importance of extracts as pharmaceutical products has been recognized at an early date, and much attention has always been paid to their preparation. With the gradual perfection of methods and apparatus this importance has not been diminished. In the numerous essays devoted to this class of medicinal agents, which have appeared from time to time, we frequently meet with historical reviews of a portion of the work previously done in the same direction; but even such reviews rarely trace the subject matter to its original conception. In the work before us the author aims at covering the entire field of the preparation or manufacture of extracts from the earliest time to the present, and to trace, step by step, the improvements which have been introduced in the processes as well as in the utensils and apparatus. The whole subject is treated from the historical standpoint alone, the first part being devoted to the processes of evaporation, followed by the methods and apparatus used for the exhaustion of plants. Although it would seem that the latter should be considered first, since exhaustion must precede the operation of concentration, the author has chosen the order indicated, because much attention has originally been given to evaporation under various conditions, before any material change was made in the methods of extraction. The third part treats of the employment of low temperatures (freezing) in the preparation of extracts; and the following of the preservation of extracts in their original condition and quality, so as to avoid changes incidental to their drying out, absorption of moisture, moulding, fermentation, etc. The last chapter is devoted to preparations peculiar to British and American pharmacy, namely to liquid extracts, fluid extracts and abstracts. Under each chapter the chronological order is preserved as much as possible without, however, sacrificing clearness in the consideration of the gradual, and often times slow, perfection of the various methods and apparatus.

It will be seen from the foregoing that the book is a unique one, and we may add that it is a very valuable contribution to pharmaceutical literature, more particularly to the history of pharmacy. The text is illustrated with more than one hundred wood cuts of implements and apparatus, among them a number which have been devised by the author during his prolonged pharmaceutic experience, or which are in use at the laboratory of Courbevoie.

A very valuable addition to the work—or perhaps more properly part of it—consists of bibliographical tables, the one arranged alphabetically, the other chronologically, of publications treating of the different subjects to which the work is devoted. Commencing with the year 1471 and ending in 1889, these tables have been prepared with great care, so that, probably, few only of what may be considered the more important essays have been omitted; they contain, in each case, the full title, name of author, place and date of publication. While the literature of every nation has been thus collated, essays from Great Britain and the United States, besides France, are particularly numerous during the past thirty years, which is due to the attention paid here to percolation, and to the extensive use of fluid extracts.

The make-up of the work is unexceptional; but few errata have escaped the author's notice, most of them being corrected on page xvi. The work will be

found both important and useful by those interested in the history of pharmacy.

Orthosulphobenzoic Acid and some of its derivatives. By A. R. L. Dohme. Baltimore: 1889. Pp. 38.

A dissertation from Johns Hopkins University for the degree of doctor of philosophy. Incidental to the researches mapped out the author ascertained that commercial *saccharin* is not a uniform product, but contains only from 30 to 40 per cent. of benzoic sulphinide, while parasulphaminebenzoic acid forms from 50 to 60 per cent. of the commercial article, about 10 per cent. being various other derivatives.

Histologische und chemische Untersuchungen der gelben und rothen amerikanischen und einiger cultivirten Java-Chinarinden der Sammlung des Dorpater pharmaceutischen Institutes. Von Eugen Wilbuschewicz, Dorpat: 1889. Pp. 80.

Histological and chemical investigations of the yellow and red cinchona barks, of American origin or cultivated in Java, and contained in the collection of the pharmaceutical institute at Dorpat.

A dissertation from the University of Dorpat for the degree of master of pharmacy. The aim of the histological examination was to ascertain the botanical origin of the numerous samples of cinchona bark, mostly received under commercial names. Twenty-one of the barks were also chemically examined.

Ueberdie Einwirkung von Säurechloriden auf Phenolaether. II. Zur Kentniss des Bors. Von Henry C. C. Maisch. Göttingen, 1889, pp. 42.

On the action of aci-chlorides upon phenol-ethers. II. Contribution to the knowledge of boron.

A dissertation from the university of Göttingen for the degree of doctor of philosophy. The first part treats upon the effect of acetyl-chloride and benzoyl-chloride upon anisol, phenetol and analogous compounds. The second part contains researches on the advantageous preparation of boron and its chloride.

A Manual of Chemistry for the use of medical students. By Brandreth Symonds, A. M., M. D., etc. Philadelphia: R. Blakiston, Son & Co., 1889, pp. 154. Price $2.00.

The author having, for several years, prepared students in this branch, both for their degrees and for entrance into the government medical services, states that the book is not designed to be a medical chemistry. It is a brief recapitulation of the most important chemical facts, particularly of those applying to medicine and hygiene; hence water, air, urine, etc., receive special attention. If properly used, merely as a remembrancer, the little work will serve quite a useful purpose.